Soils of the Ecosystem Management Emulating Natural Disturbance (EMEND) experimental area, northwestern Alberta

B.E. Kishchuk

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SOILS OF THE ECOSYSTEM MANAGEMENT EMULATING NATURAL DISTURBANCE (EMEND) EXPERIMENTAL AREA, NORTHWESTERN ALBERTA

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ABSTRACT

The Ecosystem Management Emulating Natural Disturbance (EMEND) experiment in northwestern Alberta was undertaken to determine the management practices that best emulate natural disturbance in maintaining ecosystem structure and function in western boreal mixedwood forests. This report provides detailed information about the classification, chemical and physical properties, and elemental pools of soils in the EMEND experimental area. Twenty-five soil profiles were described and sampled by pedogenetic horizon from the upper surface of the forest floor to lower soil horizons. Taxonomic classification, chemical and physical properties of the soil horizons, and carbon and nutrient pools of soil horizons and complete profiles were determined. Soils in the EMEND experimental area have developed on fine-textured glacial till or glaciolacustrine deposits containing few coarse fragments. The soils were primarily Luvisolic, with limited occurrence of Brunisolic, Gleysolic, and Solonetzic soils. The soils were generally well drained and were relatively consistent across the 1000-ha experimental area.

RÉSUMÉ

L'expérience de gestion de l'écosystème par émulation des perturbations naturelles (GEEPN) menée dans le nord-ouest de l'Alberta a été entreprise afin de connaître les pratiques d'aménagement qui simulent le mieux les perturbations naturelles et maintiennent la structure et la dynamique de l'écosystème dans les forêts mixtes boréales de l'Ouest. Le présent rapport fournit des renseignements détaillés sur la classification, les propriétés chimiques et physiques et les réserves de substances élémentaires des sols de la région de l'expérience de GEEPN. Vingt-cinq profils pédologiques ont été décrits et échantillonnés par horizon pédogénétique depuis la partie supérieure de la couverture morte jusqu'aux horizons inférieurs du sol. Le taxon, les propriétés chimiques et physiques et les réserves de carbone et d'éléments nutritifs des horizons du sol et des profils complets ont été déterminés. Dans la région de l'expérience de GEEPN, les sols se sont développés sur des tills glaciaires à texture fine ou des dépôts glaciolacustres contenant peu de fragments grossiers. On y retrouve surtout des luvisolique et parfois, certains sols brunisoliques, gleysoliques et solonetziques. Les sols étaient généralement bien drainés et relativement uniformes dans l'ensemble du secteur expérimental de 1000 ha.

DEDICATION

For my family

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INTRODUCTION

The Ecosystem Management Emulating Natural Disturbance (EMEND) experiment was established in northwestern Alberta to determine the management practices that best emulate natural disturbance in maintaining ecosystem structure and function in western boreal mixedwood forests (Volney et al. 1999). Ecosystem processes and productivity in undisturbed conditions and under natural disturbance are being used as the benchmarks against which harvesting and prescribed fire and slash-burning are being evaluated in this large-scale, long-term study.

This approach has developed out of the need to examine the role of residual forest cover in maintaining and preserving ecosystem structure and function under forest harvesting systems that incorporate retention of unharvested residual areas. Development of variable retention silvicultural practices has ensued from consideration of alternatives to extensive clearcutting, with maintenance of some residual structure on the landscape. However, questions about the amount, pattern, and distribution of residual structure, the role of residual structure in determining the attributes of the remaining and regenerating stands, and the contribution of this information to management practices in the western boreal mixedwood need to be addressed.

The EMEND experiment has the following objectives:

- To determine the effects of forest harvest, fire, and regenerative practices on successional pathways, maintenance of natural communities, nutrient cycling, site productivity, biodiversity, spatial patterns of forest structure, hydrological processes, and regeneration and to compare these findings with the corresponding features of mixedwood landscapes that have originated through wildfire and other natural disturbances.

- To determine ecological and productivity responses to variable harvesting intensities and fire in a controlled, replicated experiment for different vegetative cover types representative of successional stages in the boreal mixedwood.

- To determine the degree to which uncut residual stands preserve ecosystem integrity, identify a functional balance between ecological and operational management objectives in mixedwood stands, and provide a basis for the selection of appropriate management practices for these forests.

The following experimental components have been undertaken to date in the EMEND study:

- comparison of the impacts of variable retention treatments (clear-cut harvesting; 10%, 20%, 50%, and 75% green tree retention; and uncut controls) on ecosystem structure, function, and productivity

- comparison of the effects of variable retention harvesting treatments with those of fire in standing timber

- comparison of harvested sites with unburned and burned slash

- identification of interactions among disturbance and stand-type impacts.

The information presented in this report is part of a larger study of soils, nutrient cycling, and soil organic matter within the EMEND experiment.

Little information is available about the soils in the EMEND experimental area, such as pedogenetic properties of the soils, nutrient availability and limitations, nutrient and carbon (C) pools, and foliar nutrition. Previously, preliminary and coarse-scale soil survey information was available for the experimental area (Lindsay et al. 1958), but the soils in a range of successional stages in the boreal mixedwood have been thoroughly characterized and described during the establishment of this long-term, controlled, replicated study to establish baselines for monitoring changes influenced by both disturbance and stand development. Information from other research studies within the EMEND experiment (of hydrology, vegetation, and ecological site classification) has been incorporated into this report as background. Further information on taxonomic soil description and classification, the Canadian System of Soil Classification, and the soil orders found within this experimental area can be found in Appendix 1 of this report, as well as in reports by the Soil Classification Working Group (1998) and Valentine et al. (1986).

The purposes of the current report are as follows:

- to provide descriptions and taxonomic classification of the soils in the EMEND experimental area

- to provide detailed information about the chemical

and physical properties of the soil profiles by pedogenetic horizon across the experimental area

- to provide detailed information on nutrient and carbon pools, by soil horizon and soil volume, from the soil surface to the C horizon.

The information presented in this report is not specifically linked to the influence of stand types or treatments in the EMEND experiment, as this subject is being addressed in other studies being conducted by researchers in the Canadian Forest Service, the University of Alberta, and the University of British Columbia. Comprehensive studies of the influence of stand type and impact of harvesting and fire treatments on soil nutrient and carbon pools, properties of soil organic matter, nutrient turnover, and foliar nutrition are in progress and are being reported elsewhere (Kishchuk 2002; Hannam et al. 2004; B.E. Kishchuk, manuscript in preparation). Baseline information on the properties and nutrient and carbon pools of the surface soil for all treatments and stand types was collected in 1998, before any harvesting or fire treatments. Soil properties, elemental pools, nutrient turnover rates, and foliar nutrition were measured again in the first year after disturbance (1999 in the case of harvesting, and 2000 or 2001 in the case of standing timber burns). These measurements will be repeated at intervals to determine the longer-term impacts of disturbance on soils and site productivity. Detailed studies of the chemistry and morphology of the soil organic matter, nutrient availability, microbial dynamics, and nutrient transformation processes have been incorporated into this framework by researchers at the University of Alberta and the University of British Columbia in continuing studies.

EMEND EXPERIMENTAL AREA: BACKGROUND INFORMATION

Location and Meteorological Characteristics

The EMEND experimental area is located about 90 km northwest of Peace River, Alberta (Fig. 1), in the Clear Hills Upland Ecoregion within the Boreal Plains Ecozone (Wiken 1986; Ecoregions Working Group 1989), which corresponds to the Lower Foothills Natural Subregion (Alberta Environmental Protection 1994). The experimental area extends from approximately 56°44'N to 56°51'N and from 118°19'W to 118°27'W. It is located in Tps 89 and 90, R 3, west of the 6th Principal Meridian, within Alberta map sheet 84-D (Alberta Environmental Protection 1998). The elevation ranges from approximately 677 to 880 m above sea level.

The climate in this subregion is influenced by both boreal and mountain landscapes and weather patterns (Alberta Environmental Protection 1994). The mean annual temperature is 1.2°C at Fairview, the nearest station with long-term climate records, located about 80 km south of the EMEND area (Atmospheric Environment Service 1982a). The mean January and July temperatures are –17.7°C and 15.9°C, respectively. Mean annual precipitation is 431 mm, 38% of which falls as snow (Atmospheric Environment Service 1982b). The mean annual temperature at Keg River, another station with long-term climate records, located 115 km north of the project area, is slightly lower (–0.7°C) and the mean January temperature is lower (–22.6°C) than at Fairview. Snow depth (over 3 years) ranged from 25 to 40 cm, and water equivalents ranged from 36 to 70 mm under a spruce canopy at the EMEND site (G. Hillman, Northern Forestry Centre, personal communication, December 2003, e-mail).

Surface Geology, Surficial Materials, Landform Features, and Drainage

The bedrock in the area comprises unconsolidated and bentonitic Lower and Upper Cretaceous deposits containing sandstones, shales, and coal (Bayrock 1958). Erosion before glaciation removed large thicknesses of the Cretaceous deposits. The Clear Hills to the west of the experimental area are erosional remnants.

The last glacier in the area occured during the Wisconsin age and advanced about 24 000 years ago from the northeast over the area shown in map sheets 84-D (north half), 84-E, 84-F, and 84-G (Bayrock 1958). This overall area slopes to the northeast, and during deglaciation the retreat of the glacier was blocked by ice. The resulting surficial deposits are of three types. The first consists of glaciolacustrine deposits resulting from extensive glacial lakes that formed against the ice and whose positions changed rapidly in response to formation of meltwater outlets. These deposits are of

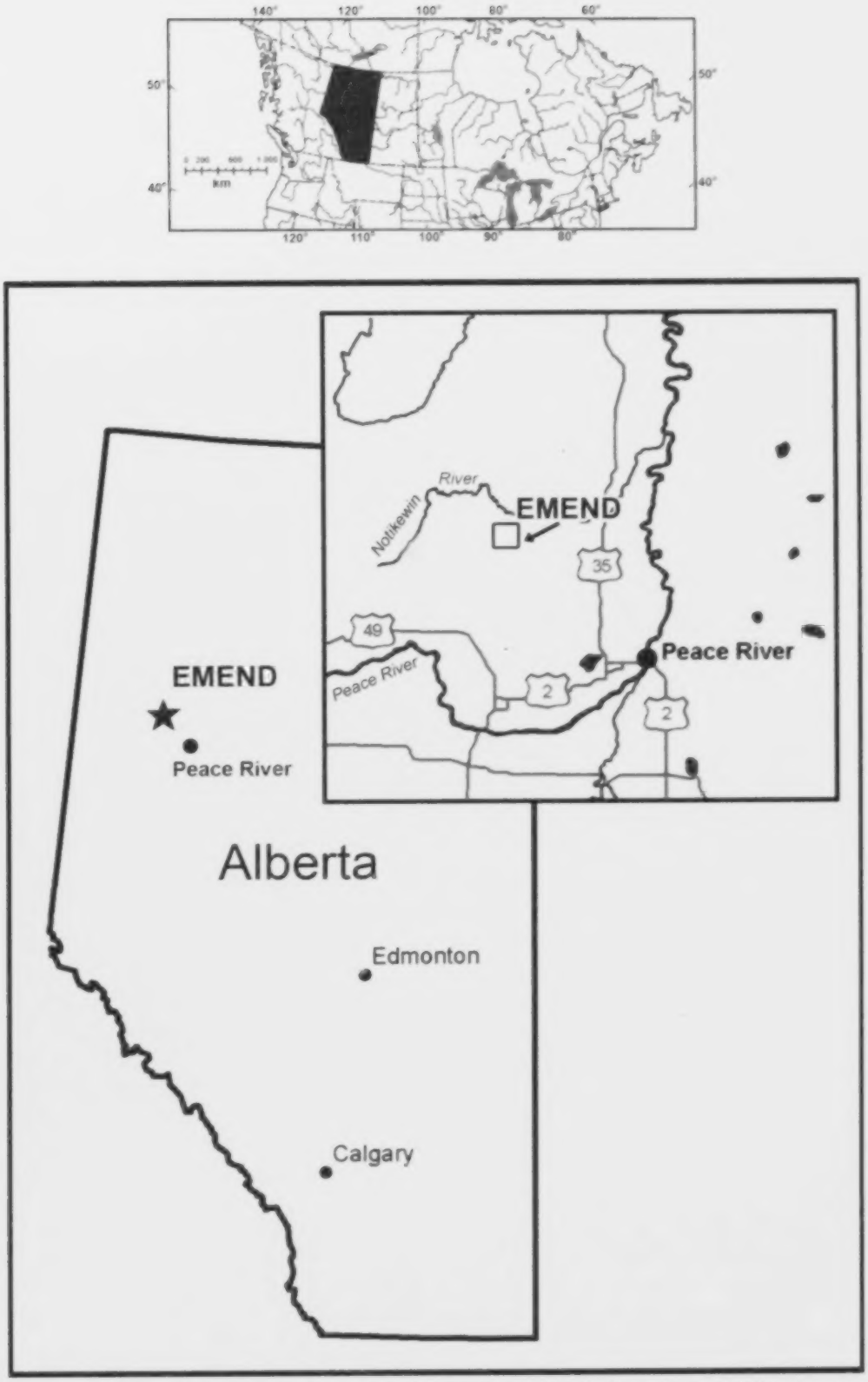


Figure 1. Location of the Ecosystem Management Emulating Natural Disturbance (EMEND) experimental area in northwestern Alberta.

varying thickness (10 cm to 10 m) and do not necessarily conform well to the topography. The second type of deposit resulted from icebergs in the glacial lakes and consists of boulders and till lenses within the lacustrine sediments. The third type of surficial deposit resulted from other features of stagnant ice such as hummocky, dead-ice moraines on both upland and lowland areas. End or recessional moraines and outwash plains are absent. The surficial material represented on these map sheets is thus either level to undulating ground moraine or lacustrine deposits.

The surficial materials within the EMEND experimental area are primarily of glacial origin, with some more recent features, including alluvial deposits and infilling of morainal depressions and lakes with organic matter (Bayrock 1958). A division running approximately diagonally from northwest to southeast separates the experimental area into two regions of surficial glacial-origin materials (Fig. 2; Lindsay et al. 1958). Surficial materials in the southwestern portion of the experimental area (area I) are primarily glacial till, with glaciolacustrine materials overlying the till in some areas. The topographic expression in this part of the area is typically morainic, with surface expression ranging from gently rolling to hilly (Lindsay et al. 1958).
Surficial materials in the northeastern portion of the experimental area (area IIB) are primarily of glaciolacustrine origin but also contain material described by Odynsky et al. (1956) as lacustro-till (Lindsay et al. 1958). The lacustro-till material is characterized by distinguishing features of both glacial till and lacustrine deposits, comprising a well-sorted, heavy clay containing few coarse fragments (≥ 2 mm), possibly derived from weathered products of shale (Odynsky et al. 1956). The topography in this portion of the experimental area is fairly uniform, ranging from depressional to undulating (Lindsay et al. 1958).

The surficial materials in the EMEND experimental area are thus a mosaic of fine-textured glaciolacustrine, glacial till, and lacustro-till deposits, as well as localized organic and alluvial materials. Figure 3 shows the location of the experimental area on a map of surficial materials generated from data at 1:1 000 000 (Fulton 1995). The placement of the experimental area on this map generally corresponds to the division of glacial till and glaciolacustrine material described in the preliminary soil survey report for the area (Lindsay et al. 1958).

Both portions of the experimental area are drained by the Notikewin and Whitemud rivers, which are part of the Peace River drainage (Lindsay et al. 1958). The southern part of the EMEND area is bounded by a ridge running northwest to southeast and reaching an elevation of 880 m (G. Hillman, Northern Forestry Centre, personal communication, December 2003, e-mail). The ridge forces tributary streams within the area to flow mainly north and east into the Notikewin River . The topographic slope is from southwest to north and northeast, and groundwater flow likely follows the topographic slope in the northeast direction, with local drainage becoming poor as the topography levels out with the approach to the Notikewin River.

Dominant groundwater flow paths are through surface organic soils and shallow mineral soils on the hill slope and through surface peats on riparian areas (G. Hillman, Northern Forestry Centre, personal communication, December 2003, e-mail). Hydraulic conductivities decrease by 3 to 5 orders of magnitude from the surface layers (0–1.0 m depth) to the underlying clay. Delivery of water is rapid when the water table intersects the surface during snowmelt and summer storm periods; groundwater recharge at depth is constrained by very low saturated conductivity. Soil profiles within the experimental area were generally well drained to a depth of 1 m or more.

Vegetation and Ecosite Classification

Four stand types are represented in the EMEND study, the dominant composition of which is shown in Table 1. Balsam fir (*Abies balsamea* (L.) Mill.), lodgepole pine (*Pinus contorta* Loudon), and tamarack (*Larix laricina* (Du Roi) K. Koch) (in decreasing order of abundance) were also present within the experimental area.

Stand types were further divided into subtypes on the basis of understory vegetation (Table 2).

Ecosite classifications (Beckingham et al. 1996) according to humus forms, moisture and nutrient regimes, drainage class, ecosite phase, and plant community type are summarized in Appendix 2.

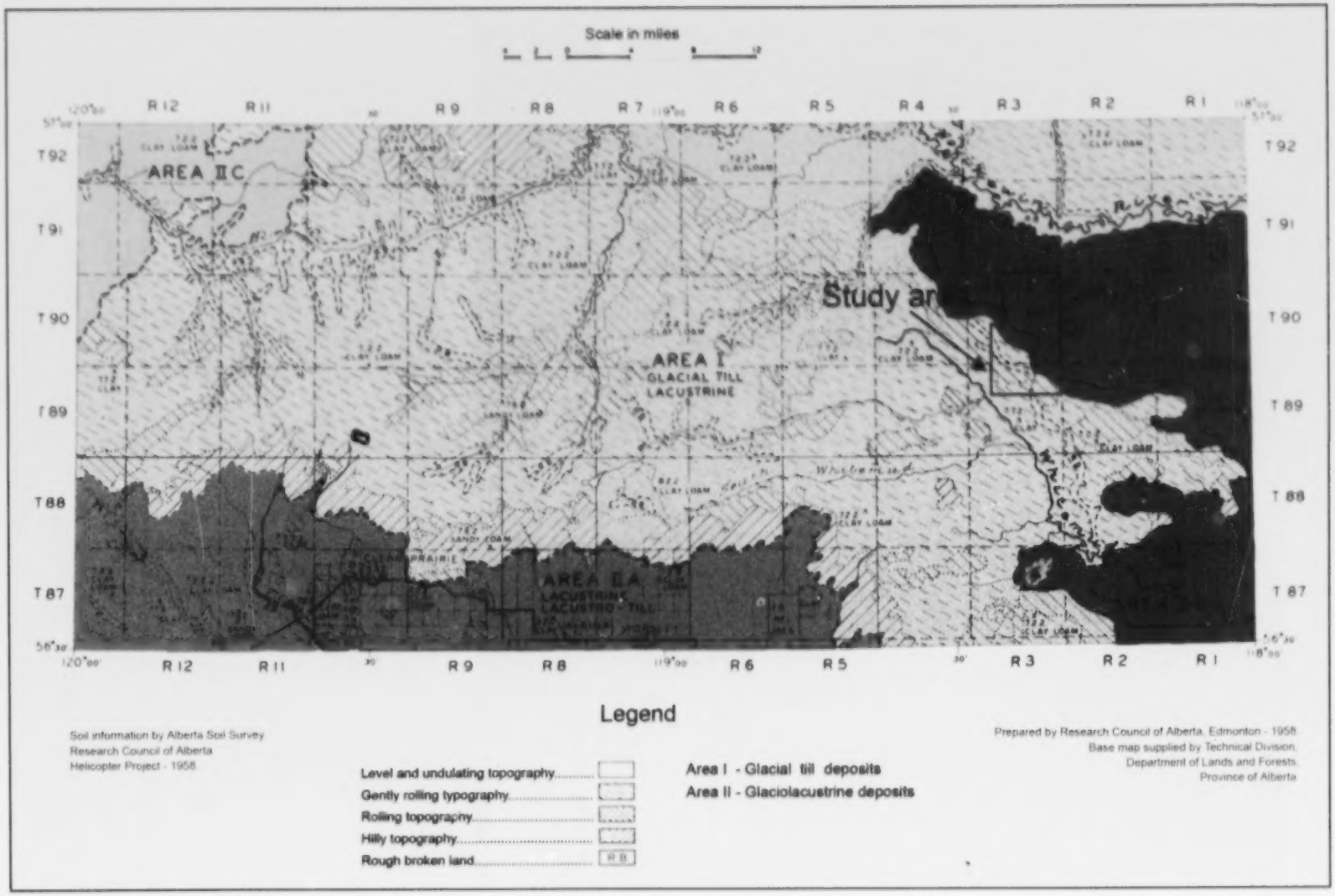


Figure 2. Preliminary soil survey of Alberta map sheet 84-D (north half) (adapted from Lindsay et al. 1958).

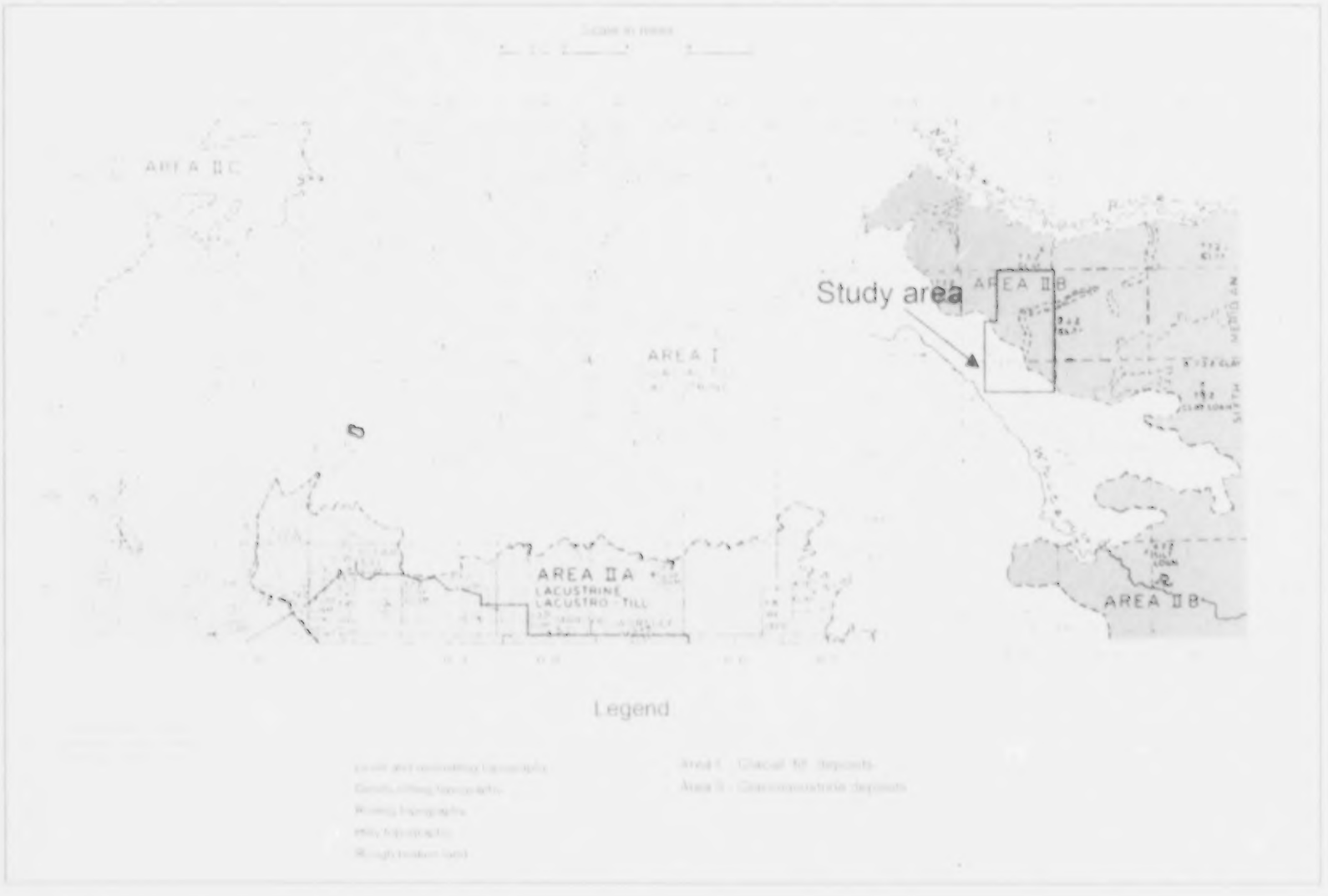


Figure 2. Preliminary soil survey of Alberta map sheet 84-D (north half)

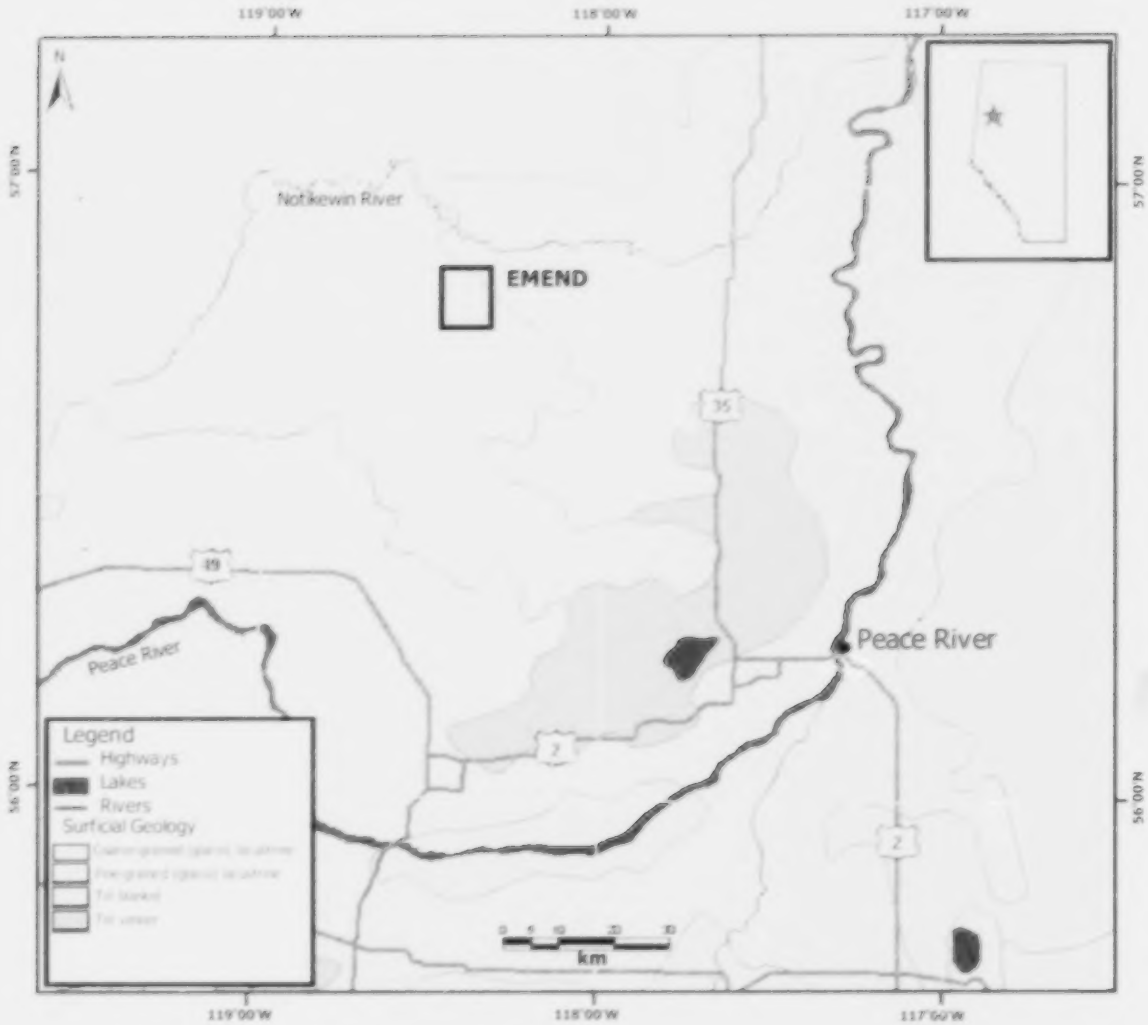


Figure 3. Surficial materials (1:1 000 000) in the Peace River region (adapted from Fulton 1995).

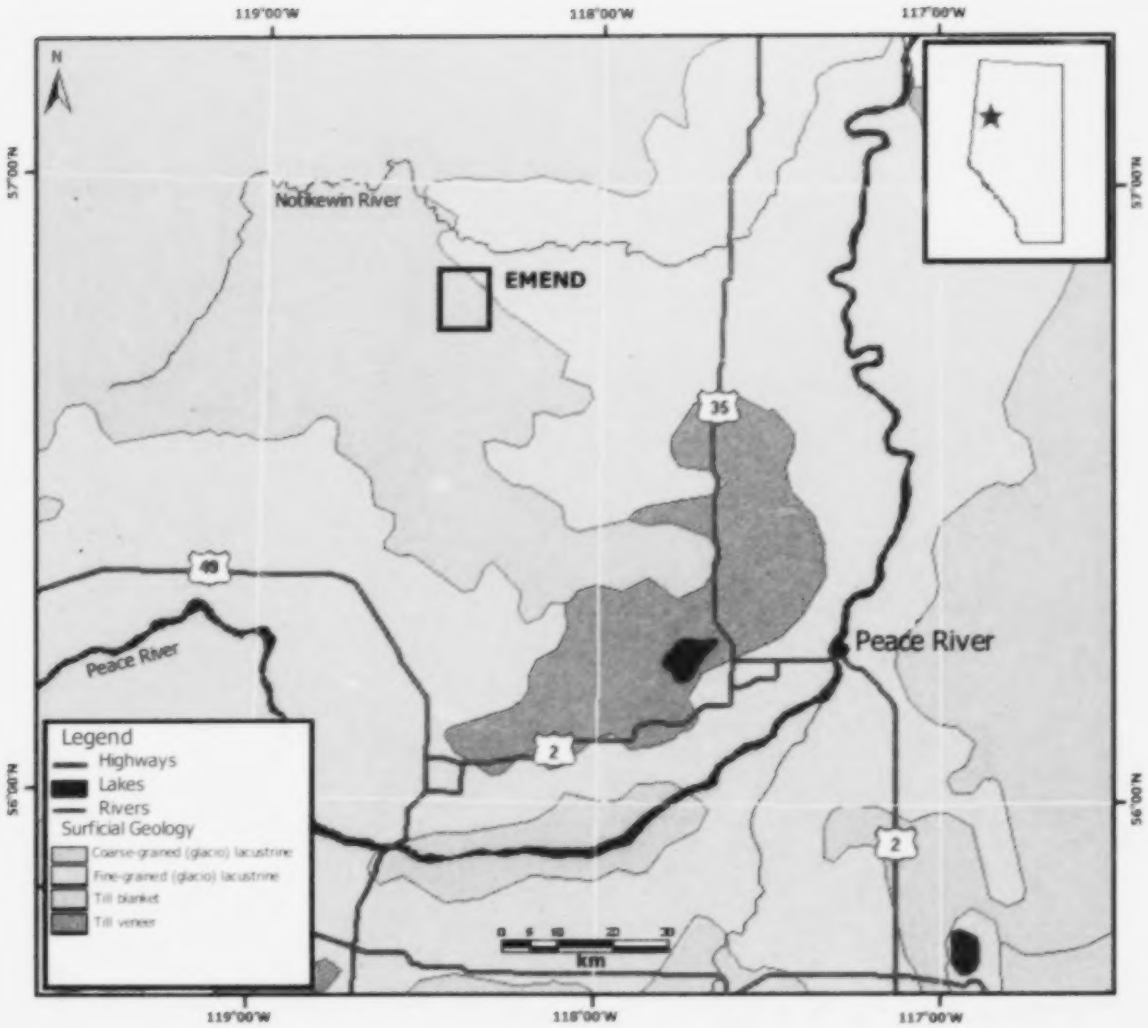


Figure 3. Surficial materials (1:1 000 000) in the Peace River region (adapted from Fulton 1995).

Table 1. Stand types, based on dominant overstory vegetation, in the Ecosystem Management Emulating Natural Disturbance experimental area[a]

Stand type	Abbreviation	Composition
Deciduous dominated	DDOM	Balsam poplar (*Populus balsamifera* L.), 50% Trembling aspen (*Populus tremuloides* Michx.), 40% Paper birch (*Betula papyrifera* Marsh.), 10%
Deciduous dominated with coniferous understory	DDOM/U	Deciduous dominated (as above) with white spruce (*Picea glauca* (Moench) Voss) understory
Mixed	MX	Deciduous and coniferous species roughly codominant
Coniferous dominant	CDOM	Primarily white spruce, but some blocks with black spruce (*Picea mariana* (Mill.) B.S.P.) dominant

[a]Source: J.D. Johnson, Canadian Forest Service, Edmonton, Alberta, personal communication, February 2004, e-mail.

Table 2. Summary of dominant vegetation types[a]

Stand type	Understory subtypes[b]
DDOM	Tall shrub: green alder (*Alnus crispa* (Ait.) Pursh) (in one compartment, 939, willows [*Salix* spp.] were the dominant tall shrub)
	Low shrub: low-bush cranberry (*Viburnum edule* (Michx.) Raf.) and prickly rose (*Rosa acicularis* Lindl.) (in one compartment, 952, Canada buffalo-berry [*Shepherdia canadensis* (L.) Nutt.] replaced prickly rose as the codominant shrub)
	No shrub/forb: a wide variety of forb species present, without significant shrub cover
DDOM/U	Low-bush cranberry and prickly rose
	Forb
	Green alder, low-bush cranberry, and prickly rose (in about equal abundance)
	Feather moss (*Hylocomium splendens* (Hedw.) B.S.G., *Pleurozium schreberi* (Brid.) Mitt., and *Ptilium crista-castrensis* (Hedw.) DeNot.)
MX	Feather moss
	Low-bush cranberry and prickly rose
	Forb
CDOM	Feather moss
	Low-bush cranberry and prickly rose
	Forb

[a]Source: J.D. Johnson, Canadian Forest Service, Edmonton, Alberta, personal communication, February 2004, e-mail.
[b]Understory subtypes have approximately equal abundance for DDOM stands and are listed in decreasing order of abundance for DDOM/U, MX, and CDOM stands.
Note: DDOM = deciduous dominant, DDOM/U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

Field Sampling

Soil pits, located to afford representative coverage of the experimental area, were dug in each of the replicated stand type units identified on the Alberta Vegetation Inventory map for the EMEND experimental area (Daishowa Mirubeni International Ltd. 1999). The map was provided by Daishowa Mirubeni International Ltd., and the composition of candidate stands was confirmed by the EMEND Core Crew. A map of the overall experimental area, showing soil pit locations, is presented as Figure 4, and maps of the 10 research blocks, showing individual experimental units (compartments), appear in Appendix 3. Soil sampling was performed in July and August 1999. One soil pit was located in each of the 23 stand type units, and there were two additional pits, for a total of 25 soil pits in the approximately 1000-ha experimental area. The location of each soil pit was permanently marked in the field.

Each soil pit was 1 m wide by 1 m long; the depth was 1 m or 25 cm into the C horizon, whichever was less. Soil profiles were described according to the criteria of the British Columbia Ministries of the Environment and Forests (Luttmerding et al. 1990) and the Canadian Soil Information System (Agriculture Canada Expert Committee on Soil Survey 1983). Surface organic horizons (L, F, and H) and mineral soil horizons were described and sampled by horizon from the upper surface of the forest floor to the bottom of the soil profile. Color, structure, and consistence were determined on field moist samples. Preliminary soil classification was done in the field according to Soil Classification Working Group (1998).

Forest floor and mineral soil samples were taken from each horizon for chemical analysis, except where shallow horizon thickness (< about 2 cm) precluded sampling. A core sample of known volume (core dimensions 5 cm radius x 5 cm height = 393 cm^3) was taken from each mineral soil horizon greater than 5 cm thickness to determine the bulk density of the horizon. The bulk density value was used to determine the nutrient content of each horizon.

Volume samples of individual forest floor horizons were not taken. Instead, bulk density values of the complete forest floor (combined L, F, and H horizons) obtained from the pretreatment assessment of the complete experimental area (Kishchuk 2002) were used to calculate forest floor nutrient content. The bulk density values in that study were the means of values from six permanent sample plots in each study compartment.

Samples for chemical analysis were kept in coolers with ice packs for the remainder of the sampling day. Samples were then kept in refrigerated storage until transport to Edmonton in coolers, where they were refrigerated until analysis. Forest floor samples were homogenized in a blender while moist, and subsamples were air-dried for analyses as required. Mineral soil samples were air-dried, sieved to 2 mm, and ground as required for analysis.

Laboratory Analysis

The samples were analyzed according to the methods of Kalra and Maynard (1991). Forest floor samples (L, F, and H horizons) were analyzed for pH (1:4 soil to liquid ratio in 0.01 *M* calcium chloride [$CaCl_2$]); total C; total nitrogen (N); extractable phosphorus (P) and sulfur; cation exchange capacity and exchangeable calcium, magnesium, potassium, and sodium determined in unbuffered ammonium chloride; and total digestible iron (Fe), manganese (Mn), and aluminum (Al). In mineral soils, the mixture for determining pH was in 1:2 soil to liquid (0.01 *M* $CaCl_2$), and Fe, Mn, and Al were determined after extraction in sodium pyrophosphate. Base saturation, particle size, and bulk density were determined for all mineral soil samples. Soil textural class was determined with the Texture AutoLookup program on the basis of the results of particle size analysis (Christopher and Mokhtaruddin 1996). Percent calcium carbonate equivalent was determined for samples with secondary carbonate enrichment (ca), carbonates (k) (Soil Classification Working Group 1998), or pH (in $CaCl_2$) of at least 6.5 (or a combination of these features). Field classifications were verified on the basis of the chemical and physical analyses (Soil Classification Working Group 1998).

Calculations and Statistical Analyses

Summary statistics (mean, standard deviation, minimum, and maximum) were determined where the same horizon was present in different soil pits. Carbon and nutrient contents were calculated from element concentration, thickness of soil horizons, bulk densities, and coarse fragment content of soils.

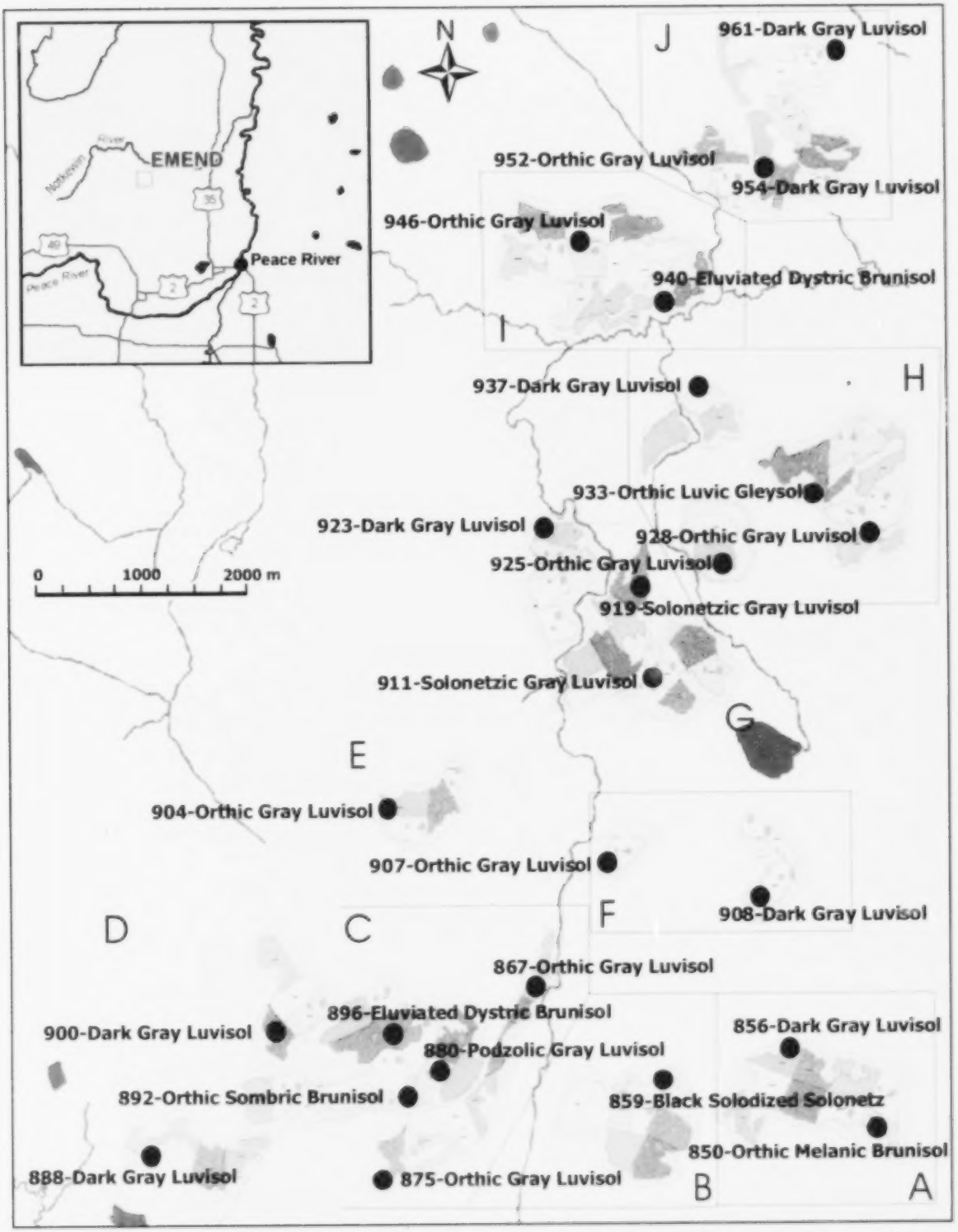


Figure 4. Ecosystem Management Emulating Natural Disturbance (EMEND) experimental area showing location of soil pits (black circles), associated compartment numbers, and soil classification. Subdivision of the experimental area into research blocks A through J is shown. Stand type units were identified from Alberta Vegetation Inventory (Daishowa-Marubeni International Ltd. 1999).

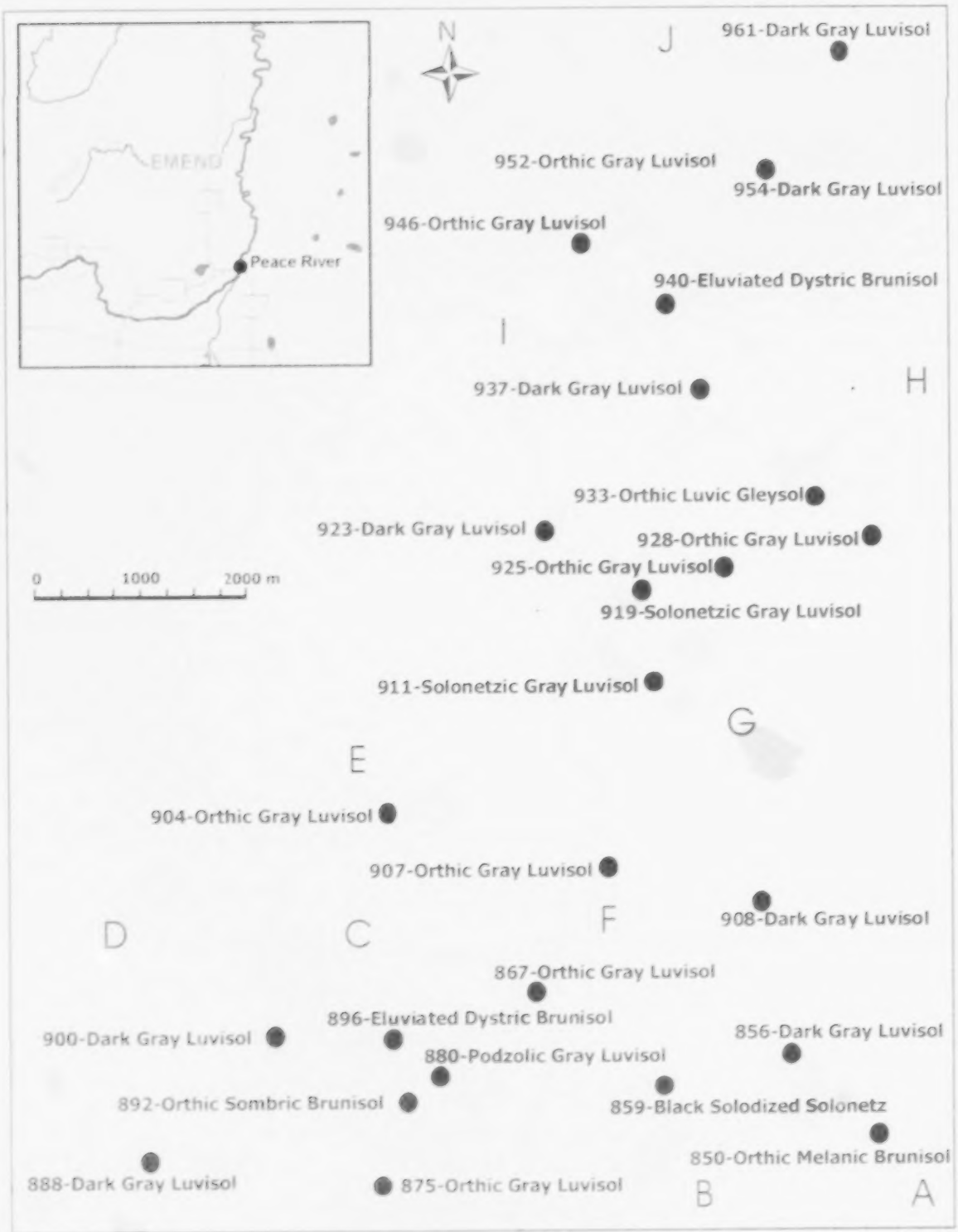


Figure 4. Ecosystem Management Emulating Natural Disturbance (EMEND) experimental area showing location of soil pits (black circles), associated compartment numbers, and soil classification. Subdivision of the experimental area into research blocks A through J is shown. Stand type units were adopted from Alberta Vegetation Inventory (Hardisty-Manalwan International Ltd. 1998).

Soil pits were located in different stand types representative of the experimental area. However, the intention of this study was to obtain information for the complete spatial extent of the experimental area and not to compare soil properties among stand types; such comparisons are being conducted in other studies. The number of soil pits was not the same for each stand type, and statistical comparisons among soil profiles were not attempted. Detailed statistical comparisons of soil properties among stand types from replicated sample plots have been presented elsewhere (Kishchuk 2002).

RESULTS

Description and Classification of Soils

The soils in the experimental area are remarkably consistent in physical, chemical, and pedogenetic properties, given the size of the experimental area (about 1000 ha). Mineralogical analysis was not done, but because of the nature of the glacial deposits, the soils are expected to have developed on similar parent materials. They are formed on fine-textured materials of glacial till and glaciolacustrine origin, generally containing few coarse fragments with the predominant pedologic processes being eluviation and illuviation of clay fractions. In one profile (compartment 896) a sand lens was present between finer-textured materials at approximately 56 to 78 cm depth. Soils were generally well drained to a depth of 1 m: 22 of the 25 profiles were well drained, and there were 3 imperfectly drained profiles located at the southern edge of the experimental area (compartments 892, 875, and 850).

The presence of coarse fragments (greater than 5% by volume) was used as an indicator of whether soil profiles developed on glacial till or glaciolacustrine material; on this basis, the distribution of the soil profiles did not correspond to the general delineation of surficial materials identified in the preliminary soil survey report (Lindsay et al. 1958). However, even where coarse fragments were present, they were few in number, and profiles containing coarse fragments may have been derived from either glacial till or the previously described lacustro-till deposits.

Soil classifications are listed by compartment in Table 3, with compartments grouped by soil subgroup and stand type. The majority of the 25 soil profiles sampled and described were Luvisolic (19 or 76% of profiles); the remainder were Brunisolic (4 or 16%), Gleysolic (1 or 4%), and Solonetzic (1 or 4%) (Appendix 1). Soils were generally fine textured, with Bt horizons present in 21 of the 25 profiles, and Btj horizons present in one additional profile. Forest floors were mors and moders, with Humimors typically present in the CDOM stands, and Mormoders typical in the DDOM stands (Hannam et al. 2004). Detailed soil profile descriptions, including horizon designation and thickness, color, textural class, structure, consistence, root abundance, and coarse fragment content, are given in Appendix 4. The order of compartments in this and subsequent appendixes follows that in Table 3. Photographs of representative soil profiles appear in Figure 5.

Physical and Chemical Properties of Soils

The chemical and physical properties of individual horizons from each soil profile are given in Appendix 5. Forest floor properties are summarized in Table 4. Mean forest floor pH across the experimental area (mean of L, F, and H horizons) was 5.18, mean C concentration was 42.2%, mean N concentration was 1.3%, and mean P concentration was 90.4 mg/kg.

The properties of representative mineral soil horizons are summarized in Table 5, and the properties of the remaining mineral soil horizons are summarized in Appendix 6. Mean pH values across the experimental area were 4.80 in the Ae horizon, 5.09 in the Bt horizon, and 4.95 in the C horizon. Mean total C and N concentrations were 1.0% and 0.1%, respectively, in the Ae horizon, 0.8% and 0.07%, respectively, in the Bt horizon, and 1.2% and 0.07%, respectively, in the C horizon. Mean extractable P concentrations were 8.4 mg/kg in the Ae horizon, 4.5 mg/kg in the Bt horizon, and 7.7 mg/kg in the C horizon. Mean clay content was 36%, 57%, and 54% in the Ae, Bt, and C horizons, respectively. Mean bulk density was 1.33 g/m^3 in both the Ae and Bt horizons and 1.39 g/m^3 in the C horizon.

Carbon and Nutrient Content of Soils

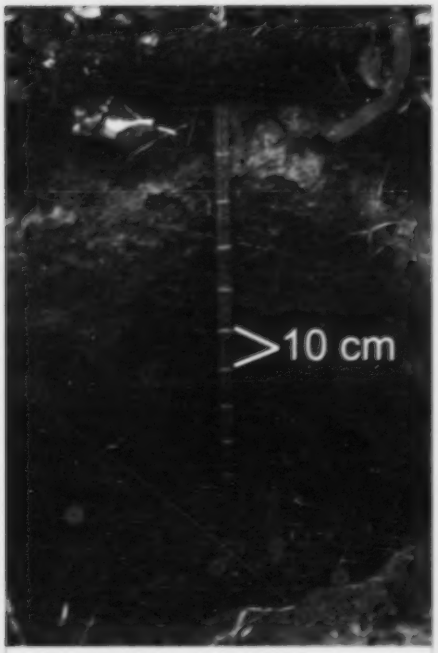
The distribution of elements in soil profiles is presented graphically with subdivided horizons combined (e.g., Bt1 and Bt2 combined as Bt) in Figures 6 to 16. Carbon and nutrient contents for individual horizons, the entire forest floor, the entire mineral soil, and the entire soil profile, as both absolute amounts (kg/ha) and standardized by soil volume (kg/m^3) are presented in Appendix 7.

Mean C content of the entire forest floor across the experimental area (mean depth of 0.11 m) was 34 768 kg/ha, and mean C content of the entire mineral soil profile sampled across the experimental area (mean depth of 1.05 m) was 129 650 kg/ha. Mean N content of the forest floor and mineral soil across the experimental area was 1 218 and 10 464 kg/ha, respectively. Mean P content of the forest floor and mineral soil across the experimental area was 7 and 83 kg/ha, respectively.

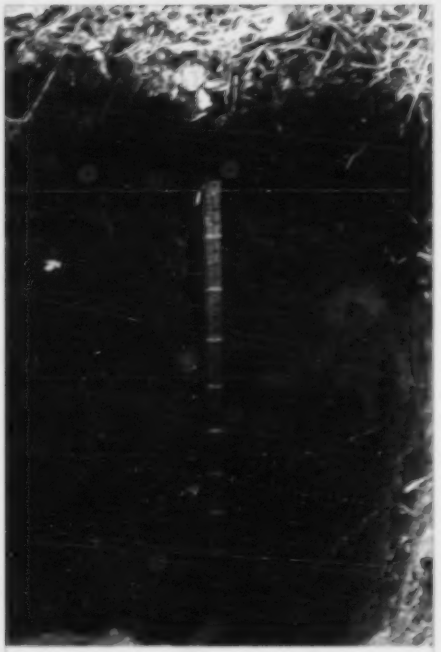
Table 3. Soil taxonomic classification and range of coarse fragment contents for soil profiles within 25 compartments, with compartments grouped by soil subgroup and stand types within subgroups

Soil subgroup and compartment[a]	Stand type	Coarse fragments (% by volume)
Orthic Gray Luvisol		
952	DDOM	0–20
907	DDOM	0–25
946	DDOM/U	0–5
867	MX	0
928	MX	0–40
904	MX	0–5
875	MX	0–10
925	CDOM	0–5
Dark Gray Luvisol		
856	DDOM	0–10
888	DDOM/U	0–20
961	DDOM/U	0–30
954	DDOM/U	0–40
900	MX	0–10
908	MX	0–10
937	MX	0–15
923	CDOM	0–50
Solonetzic Gray Luvisol		
911	MX	0–20
919	CDOM	0–5
Podzolic Gray Luvisol		
880	DDOM/U	0–40
Orthic Melanic Brunisol		
850	DDOM	0–10
Orthic Sombric Brunisol		
892	CDOM	0–5
Eluviated Dystric Brunisol		
940	DDOM	0–10
896	CDOM	0–40
Orthic Luvic Gleysol		
933	CDOM	0–5
Black Solodized Solonetz		
859	DDOM	0

[a]Soil Classification Working Group (1998).
Note: DDOM = deciduous dominant, DDOM/U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

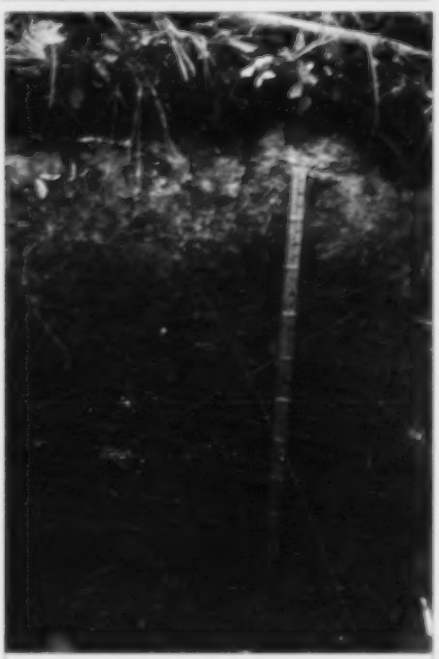


Compartment 875. Orthic Gray Luvisol; mixed deciduous and coniferous



Compartment 896. Eluviated Dystric Brunisol; coniferous dominant

Compartment 900. Dark Gray Luvisol; mixed deciduous and coniferous



Compartment 954. Dark Gray Luvisol; deciduous with coniferous understory

Figure 5. Photographs of four soil profiles in the Ecosystem Management Emulating Natural Disturbance experimental area.

Table 4. Physical and chemical properties of forest floor horizons

Property	Mean (SD)	Minimum	Maximum
L horizon (n = 22)			
pH	5.28 (0.55)	4.01	6.41
C (%)	49.6 (1.4)	47.1	52.0
N (%)	1.2 (0.4)	0.6	2.0
P (mg/kg)	89.7 (38.9)	2.9	142.6
S (mg/kg)	82.9 (51.3)	15.3	188.4
Ca (cmol(+)/kg)	38.3 (14.4)	18.8	75.1
Mg (cmol(+)/kg)	10.7 (4.3)	4.5	20.0
K (cmol(+)/kg)	3.2 (0.8)	1.5	5.1
Na (cmol(+)/kg)	2.8 (0.8)	1.7	4.4
Fe (cmol(+)/kg)	3.3 (2.2)	1.2	10.2
Mn (cmol(+)/kg)	6.9 (3.3)	2.0	13.4
Al (cmol(+)/kg)	11.6 (16.8)	0.0	56.2
CEC (cmol(+)/kg)	100.8 (21.4)	62.6	146.9
Thickness (cm)	1.5 (0.8)	0.5	4.0
Bulk density (g/cm^3)	0.08 (0.02)	0.04	0.11
F horizon (n = 25)			
pH	5.32 (0.57)	4.42	6.07
C (%)	45.4 (3.4)	36.9	52.4
N (%)	1.6 (0.4)	0.9	2.3
P (mg/kg)	92.7 (38.0)	27.5	172.6
S (mg/kg)	66.9 (58.4)	17.9	317.1
Ca (cmol(+)/kg)	59.2 (14.0)	39.2	98.8
Mg (cmol(+)/kg)	10.5 (3.7)	5.5	17.2
K (cmol(+)/kg)	2.5 (0.5)	1.4	3.6
Na (cmol(+)/kg)	2.9 (0.8)	2.2	4.9
Fe (cmol(+)/kg)	45.1 (54.6)	1.2	193.2
Mn (cmol(+)/kg)	17.8 (16.8)	2.6	76.4
Al (cmol(+)/kg)	101.5 (105.1)	0.0	362.2
CEC (cmol(+)/kg)	121.0 (24.0)	72.7	168.9
Thickness (cm)	7.7 (2.8)	3.0	14.0
Bulk density (g/cm^3)	0.08 (0.02)	0.04	0.11
H horizon (n = 16)			
pH	4.95 (0.77)	4.03	6.54
C (%)	31.5 (9.1)	17.5	46.8
N (%)	1.2 (0.3)	0.8	1.7
P (mg/kg)	88.9 (40.0)	19.8	188.6
S (mg/kg)	75.3 (123.6)	15.6	530.5
Ca (cmol(+)/kg)	47.8 (14.1)	25.8	71.6
Mg (cmol(+)/kg)	7.2 (2.9)	3.0	13.7
K (cmol(+)/kg)	1.4 (0.6)	0.4	2.5
Na (cmol(+)/kg)	2.7 (0.7)	2.2	4.3
Fe (cmol(+)/kg)	14.7 (25.3)	1.1	75.6
Mn (cmol(+)/kg)	10.8 (13.4)	1.0	42.8
Al (cmol(+)/kg)	54.6 (90.6)	0.0	260.6
CEC (cmol(+)/kg)	109.8 (27.9)	63.3	160.0
Thickness (cm)[a]	2.7 (1.4)	1.0	6.0
Bulk density (g/cm^3)[a]	0.07 (0.02)	0.04	0.11

[a] n = 17.

Note: SD = standard deviation, C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Na = exchangeable sodium, Fe = total digestible iron, Mn = total digestible manganese, Al = total digestible aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate.

Table 5. Physical and chemical properties of selected mineral soil horizons

Property	Mean (SD)	Minimum	Maximum
Ah horizon (n = 12)			
pH	5.32 (0.63)	4.33	6.56
C (%)	7.8 (3.2)	4.4	16.1
N (%)	0.50 (0.10)	0.30	0.60
P (mg/kg)	33.2 (32.1)	0.8	99.7
S (mg/kg)	22.9 (6.3)	12.3	39.6
Ca (cmol(+)/kg)	17.8 (7.3)	7.7	32.6
Mg (cmol(+)/kg)	3.3 (1.2)	1.5	5.3
K (cmol(+)/kg)	0.9 (0.4)	0.3	1.5
Na (cmol(+)/kg)	1.1 (0.8)	0.3	2.3
Fe (cmol(+)/kg)	58.4 (43.1)	1.5	138.7
Mn (cmol(+)/kg)	8.8 (8.5)	1.0	27.2
Al (cmol(+)/kg)	84.1 (59.9)	1.6	170.2
CEC (cmol(+)/kg)	49.5 (11.9)	32.7	67.0
Base saturation (%)	46 (9)	30	65
$CaCO_3$ (%)	n.d.	n.d.	n.d.
Sand (%)	22 (9)	10	40
Silt (%)	31 (7)	20	38
Clay (%)	47 (8)	38	64
Bulk density (g/cm^3)	0.79 (0.19)	0.58	1.09
Ae horizon (n = 20)			
pH	4.80 (0.59)	3.59	6.36
C (%)	1.0 (0.7)	0.3	2.5
N (%)	0.10 (0.10)	0.02	0.20
P (mg/kg)	8.4 (5.4)	2.8	28.2
S (mg/kg)	28.1 (20.9)	18.1	114.4
Ca (cmol(+)/kg)	3.6 (2.9)	1.0	10.9
Mg (cmol(+)/kg)	1.3 (0.8)	0.4	3.4
K (cmol(+)/kg)	0.2 (0.1)	0.1	0.6
Na (cmol(+)/kg)	0.5 (0.1)	0.3	1.0
Fe (cmol(+)/kg)	42.5 (22.6)	18.2	109.0
Mn (cmol(+)/kg)	1.7 (1.0)	0.6	4.2
Al (cmol(+)/kg)	69.0 (55.5)	17.6	227.5
CEC (cmol(+)/kg)	15.3 (8.7)	3.0	39.2
Base saturation (%)	39 (19)	12	95
$CaCO_3$ (%)	n.d.	n.d.	n.d.
Sand (%)	24 (14)	10	54
Silt (%)	40 (12)	22	62
Clay (%)	36 (11)	20	64
Bulk density (g/cm^3)	1.33 (0.20)	0.82	1.59
Bm horizon (n = 12)			
pH	5.42 (0.76)	4.24	6.31
C (%)	0.8 (0.5)	0.2	2.1
N (%)	0.06 (0.03)	0.02	0.13
P (mg/kg)	6.3 (1.6)	4.1	9.8
S (mg/kg)	21.9 (2.6)	18.6	28.1
Ca (cmol(+)/kg)	7.1 (2.7)	2.1	10.9
Mg (cmol(+)/kg)	2.1 (1.0)	0.6	3.9

Table 5. Continued

Property	Mean (SD)	Minimum	Maximum
K (cmol(+)/kg)	0.2 (0.1)	0.1	0.3
Na (cmol(+)/kg)	0.5 (0.2)	0.2	1.0
Fe (cmol(+)/kg)	46.3 (12.7)	24.7	76.2
Mn (cmol(+)/kg)	0.9 (0.3)	0.6	1.7
Al (cmol(+)/kg)	87.2 (73.3)	43.9	314.8
CEC (cmol(+)/kg)	24.0 (6.3)	11.1	32.3
Base saturation (%)	41 (8)	24	50
$CaCO_3$ (%)	n.d.	n.d.	n.d.
Sand (%)	31 (20)	14	74
Silt (%)	29 (10)	6	40
Clay (%)	40 (12)	20	56
Bulk density (g/cm^3)	1.45 (0.13)	1.25	1.60
Bt horizon (n = 43)			
pH	5.09 (0.89)	3.84	6.59
C (%)	0.8 (0.2)	0.5	1.5
N (%)	0.07 (0.02)	0.04	0.14
P (mg/kg)	4.5 (1.4)	2.3	8.6
S (mg/kg)	68.4 (87.4)	17.5	400.3
Ca (cmol(+)/kg)	9.1 (2.7)	3.2	14.5
Mg (cmol(+)/kg)	4.3 (1.5)	1.7	7.2
K (cmol(+)/kg)	0.3 (0.1)	0.2	0.5
Na (cmol(+)/kg)	0.7 (0.3)	0.2	2.4
Fe (cmol(+)/kg)	56.3 (21.1)	15.9	96.5
Mn (cmol(+)/kg)	0.7 (0.2)	0.5	1.4
Al (cmol(+)/kg)	108.2 (74.1)	5.1	300.4
CEC (cmol(+)/kg)	30.3 (6.2)	19.2	45.9
Base saturation (%)	48 (10)	26	75
$CaCO_3$ (%)	n.d.	n.d.	n.d.
Sand (%)	15 (5)	4	30
Silt (%)	27 (4)	18	36
Clay (%)	57 (9)	10	74
Bulk density (g/cm^3)	1.33 (0.13)	1.05	1.65
C horizon (n = 9)			
pH	4.95 (0.89)	3.94	6.21
C (%)	1.2 (1.0)	0.6	3.8
N (%)	0.07 (0.02)	0.04	0.09
P (mg/kg)	7.7 (4.5)	3.5	16.8
S (mg/kg)	24.8 (5.7)	19.7	35.7
Ca (cmol(+)/kg)	8.2 (2.7)	3.8	11.7
Mg (cmol(+)/kg)	3.4 (1.0)	2.2	5.7
K (cmol(+)/kg)	0.30 (0.05)	0.20	0.30
Na (cmol(+)/kg)	0.7 (0.3)	0.4	1.5
Fe (cmol(+)/kg)	54.9 (25.4)	27.9	96.0
Mn (cmol(+)/kg)	1.2 (1.0)	0.5	3.6
Al (cmol(+)/kg)	114.9 (81.1)	24.5	236.6
CEC (cmol(+)/kg)	28.0 (5.8)	15.0	35.7
Base saturation (%)	46 (13)	24	73
$CaCO_3$ (%)	n.d.	n.d.	n.d.
Sand (%)	18 (13)	6	52

Table 5. Concluded

Property	Mean	(SD)	Minimum	Maximum
Silt (%)	29	(6)	18	40
Clay (%)	54	(11)	30	72
Bulk density (g/cm^3)	1.39	(0.16)	1.15	1.61
Ck horizon ($n = 9$)				
pH	6.72	(0.13)	6.56	6.97
C (%)	1.2	(0.4)	0.8	2.0
N (%)	0.06	(0.02)	0.05	0.10
P (mg/kg)	4.0	(1.9)	1.6	7.6
S (mg/kg)	122.4	(141.9)	20.9	459.7
Ca (cmol(+)/kg)	20.7	(13.7)	11.7	56.3
Mg (cmol(+)/kg)	4.4	(1.0)	3.2	5.8
K (cmol(+)/kg)	0.27	(0.03)	0.23	0.31
Na (cmol(+)/kg)	0.7	(0.2)	0.4	1.0
Fe (cmol(+)/kg)	21.5	(15.3)	7.8	57.4
Mn (cmol(+)/kg)	0.8	(0.2)	0.6	1.3
Al (cmol(+)/kg)	38.4	(39.3)	8.7	120.1
CEC (cmol(+)/kg)	27.1	(6.3)	20.6	40.2
Base saturation (%)	69	(15)	49	91
$CaCO_3$ (%)	4	(2)	1	8
Sand (%)	16	(6)	6	22
Silt (%)	31	(3)	28	38
Clay (%)	53	(4)	48	60
Bulk density (g/cm^3)	1.40	(0.19)	1.15	1.73

Note: SD = standard deviation, C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, n.d. = not determined, $CaCO_3$ = calcium carbonate.

CONCLUSIONS

Soils in the EMEND experimental area are derived from fine-textured glacial till or glaciolacustrine parent materials, are generally well drained, and contain few coarse fragments. The soils are primarily Luvisolic, with limited occurrence of Brunisolic, Gleysolic, and Solonetzic soils. The soils are consistent in their chemical, physical, and taxonomic properties across the approximately 1000-ha experimental area. Such low variability in soil properties across a forested area of this size will facilitate the identification of differences in soil properties due to stand type and the impacts of disturbance treatments applied to the landscape. The data on chemical properties, physical properties, and C and nutrient pools presented here provide a comprehensive description of the soils within the experimental area and will serve as a baseline for further monitoring and assessment of natural and harvesting-based impacts on soil properties within the EMEND experimental area.

ACKNOWLEDGMENTS

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Figure 6. Distribution of carbon in soil profiles, by horizon. Subdivided horizons within a profile (e.g., Bt1, Bt2) are combined and presented as a single horizon (e.g., Bt). Compartments are ordered by soil subgroup and stand types within subgroups and are identified by compartment number. DDOM = deciduous dominant, DDOM U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

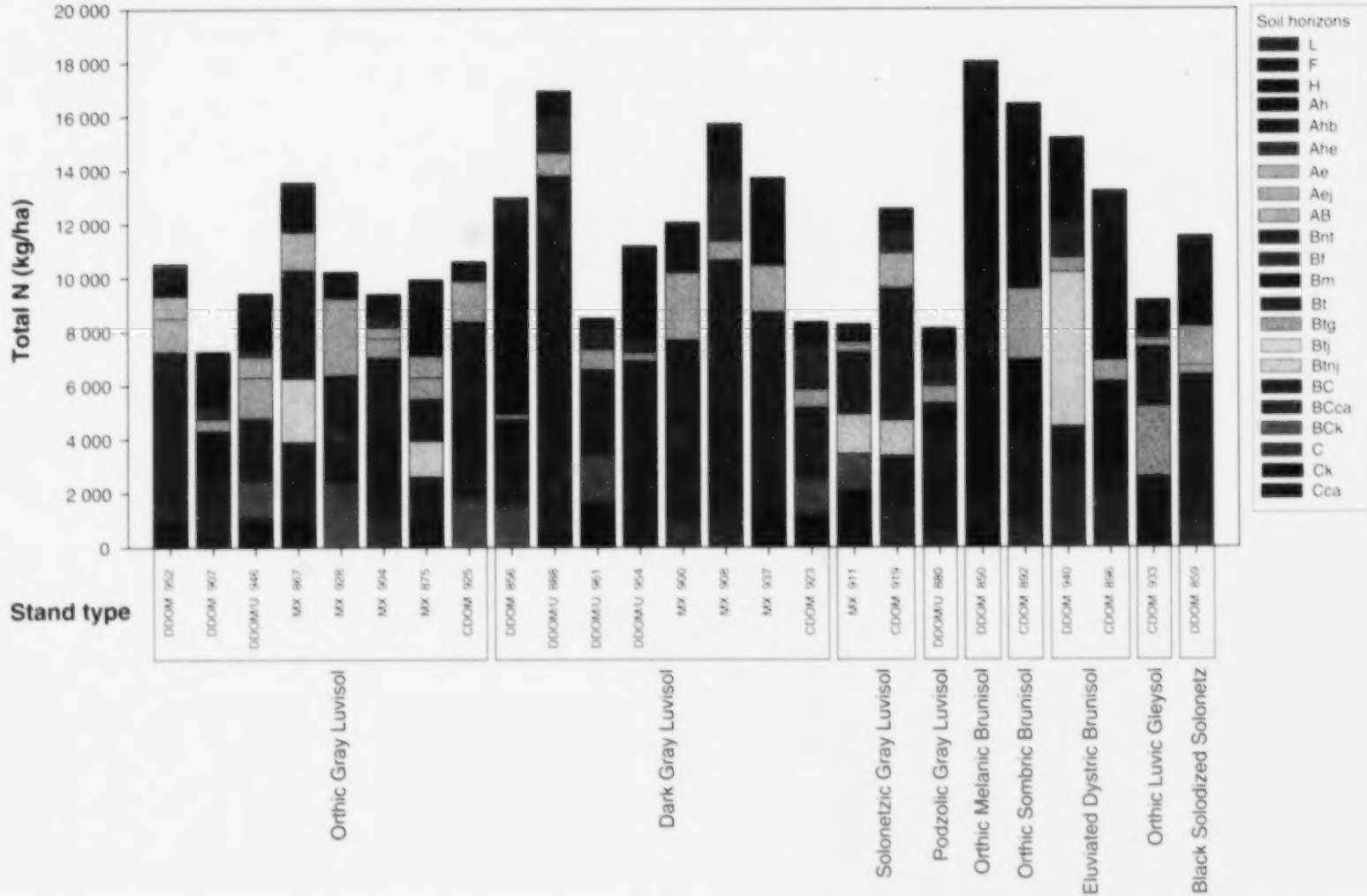

Figure 7. Distribution of nitrogen in soil profiles, by horizon. Subdivided horizons within a profile (e.g., Bt1, Bt2) are combined and presented as a single horizon (e.g., Bt). Compartments are ordered by soil subgroup and stand types within subgroups and are identified by compartment number. DDOM = deciduous dominant, DDOM/U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

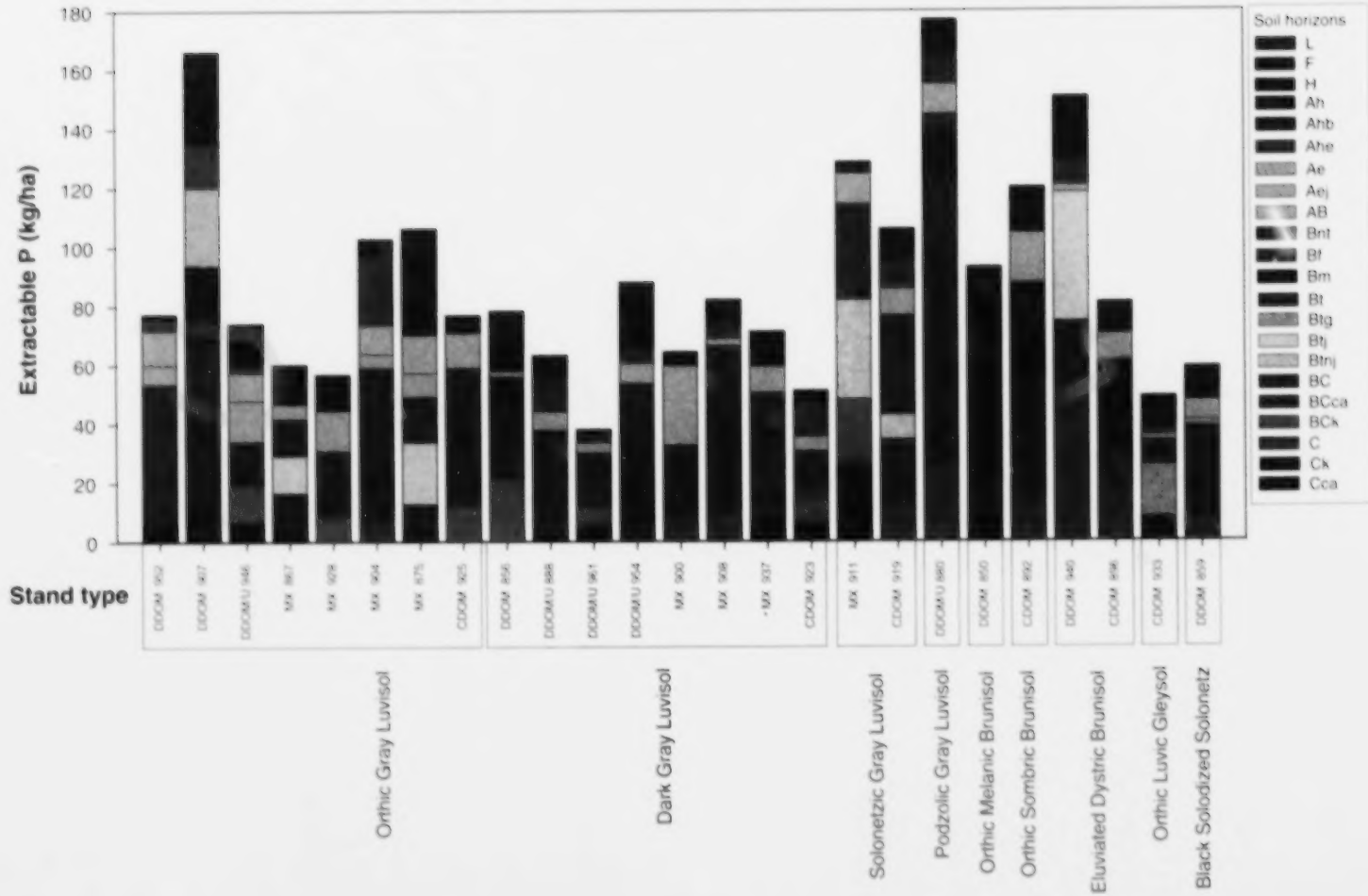

Figure 8. Distribution of phosphorous in soil profiles, by horizon. Subdivided horizons within a profile (e.g., Bt1, Bt2) are combined and presented as a single horizon (e.g., Bt). Compartments are ordered by soil subgroup and stand types within subgroups and are identified by compartment number. DDOM = deciduous dominant, DDOM-U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

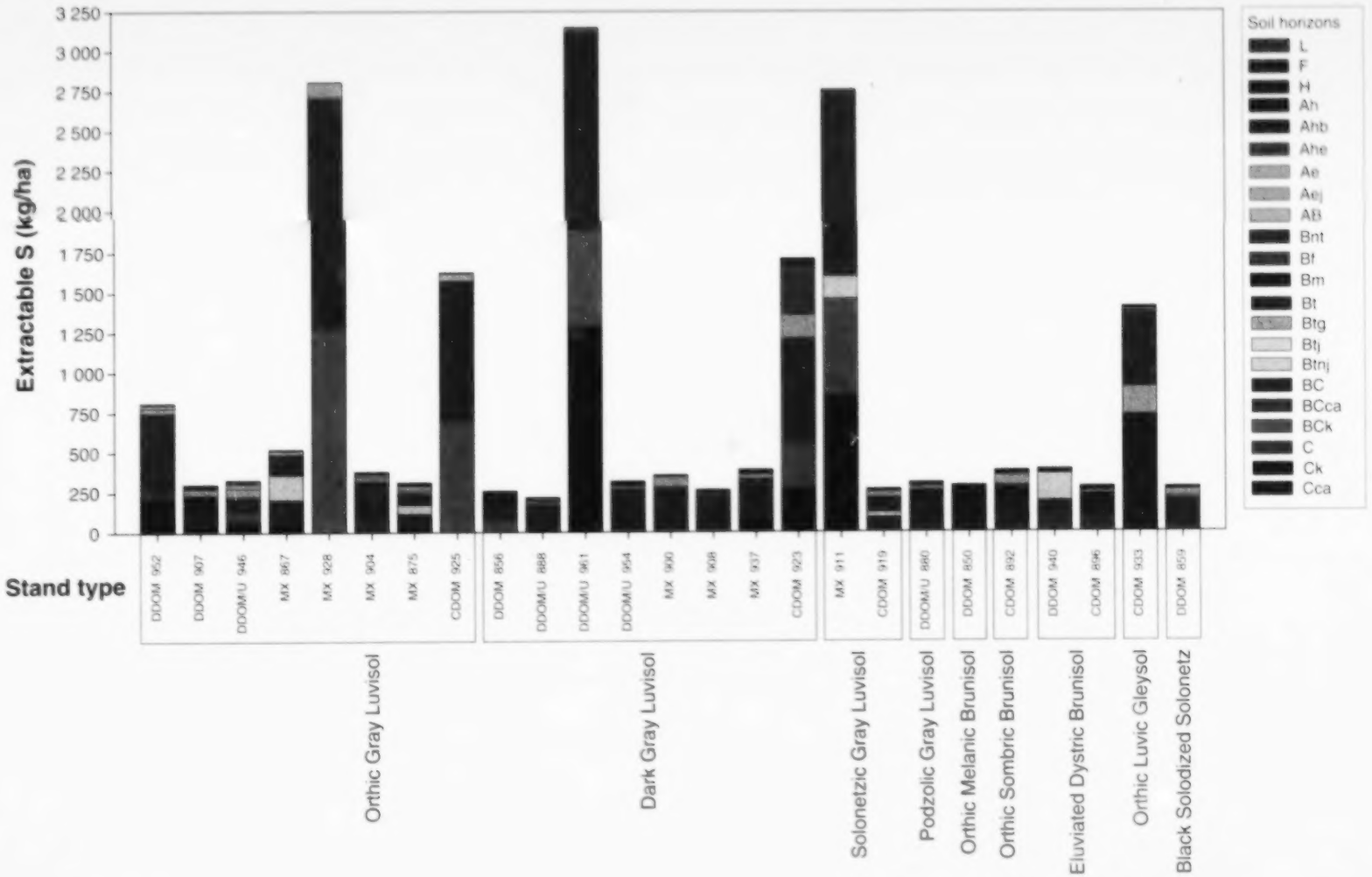

Figure 9. Distribution of sulfur in soil profiles, by horizon. Subdivided horizons within a profile (e.g., Bt1, Bt2) are combined and presented as a single horizon (e.g., Bt). Compartments are ordered by soil subgroup and stand types within subgroups and are identified by compartment number. DDOM = deciduous dominant, DDOM/U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

Figure 10. Distribution of calcium in soil profiles, by horizon. Subdivided horizons within a profile (e.g., Bt1, Bt2) are combined and presented as a single horizon (e.g., Bt). Compartments are ordered by soil subgroup and stand types within subgroups and are identified by compartment number. DDOM = deciduous dominant, DDOM U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

Figure 11. Distribution of magnesium in soil profiles, by horizon. Subdivided horizons within a profile (e.g., Bt1, Bt2) are combined and presented as a single horizon (e.g., Bt). Compartments are ordered by soil subgroup and stand types within subgroups and are identified by compartment number. DDOM = deciduous dominant, DDOM/U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

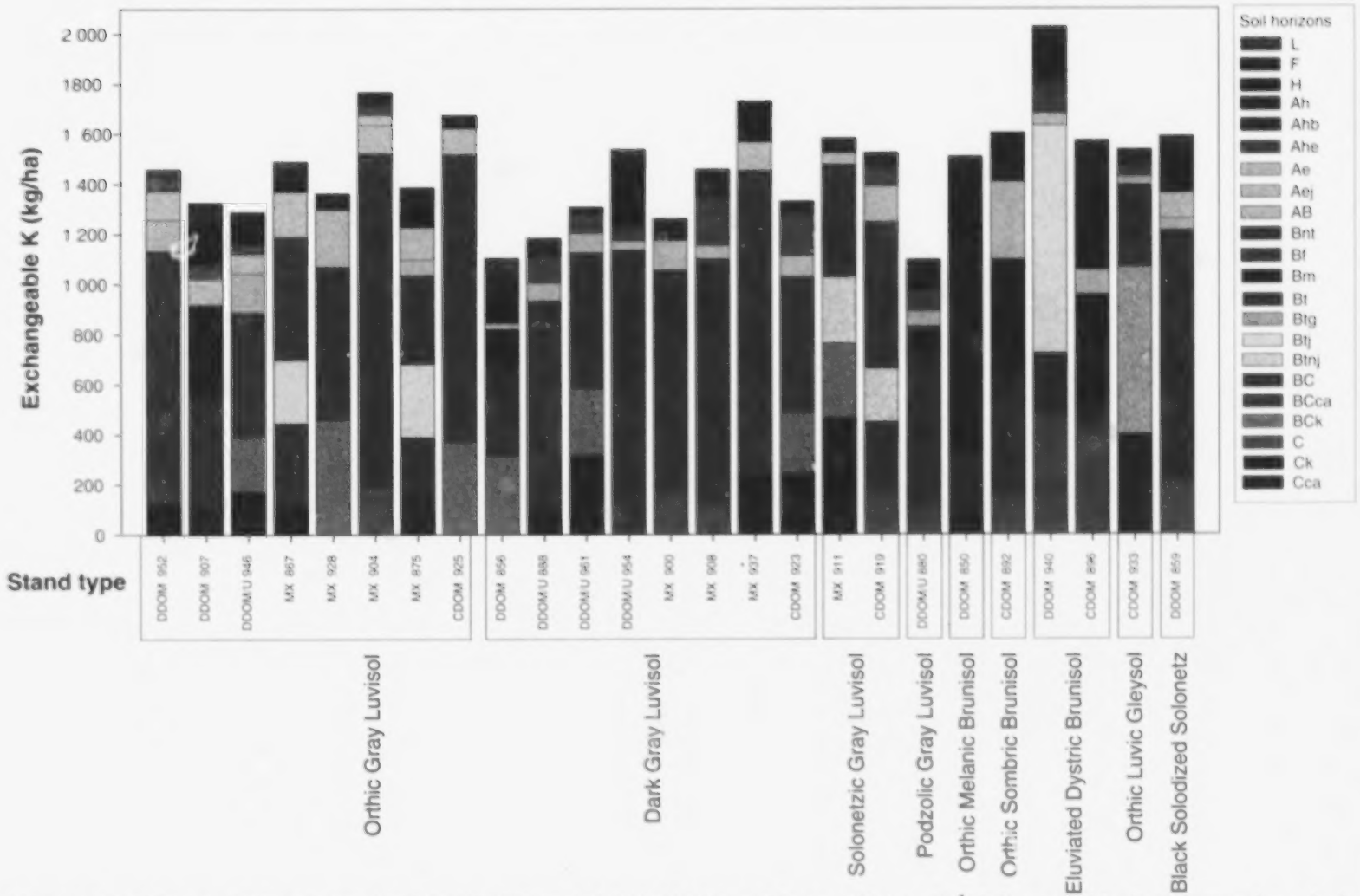

Figure 12. Distribution of potassium in soil profiles, by horizon. Subdivided horizons within a profile (e.g., Bt1, Bt2) are combined and presented as a single horizon (e.g., Bt). Compartments are ordered by soil subgroup and stand types within subgroups and are identified by compartment number. DDOM = deciduous dominant, DDOM/U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

Figure 13. Distribution of manganese in soil profiles, by horizon. Forest floor values are total digestible and mineral soil values are sodium pyrophosphate extractable. Subdivided horizons within a profile (e.g., Bt1, Bt2) are combined and presented as a single horizon (e.g., Bt). Compartments are ordered by soil subgroup and stand types within subgroups and are identified by compartment number. DDOM = deciduous dominant, DDOM U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

Figure 14. Distribution of sodium in soil profiles, by horizon. Subdivided horizons within a profile (e.g., Bt1, Bt2) are combined and presented as a single horizon (e.g., Bt). Compartments are ordered by soil subgroup and stand type within subgroups and are identified by compartment number. DDOM = deciduous dominant, DDOM U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

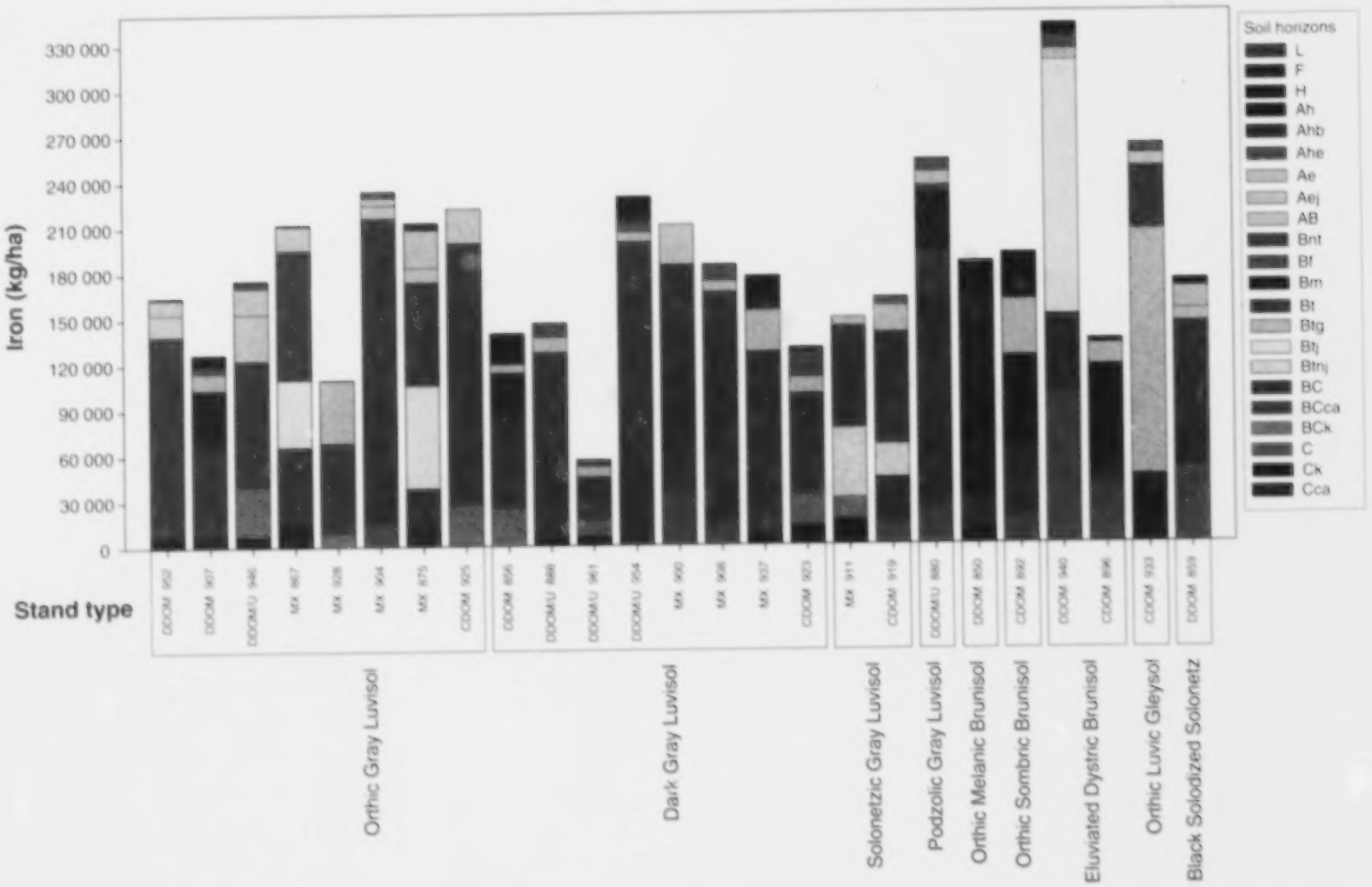

Figure 15. Distribution of iron in soil profiles, by horizon. Forest floor values are total digestible and mineral soil values are sodium pyrophosphate extractable. Subdivided horizons within a profile (e.g., Bt1, Bt2) are combined and presented as a single horizon (e.g., Bt). Compartments are ordered by soil subgroup and stand types within subgroups and are identified by compartment number. DDOM = deciduous dominant, DDOM/U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

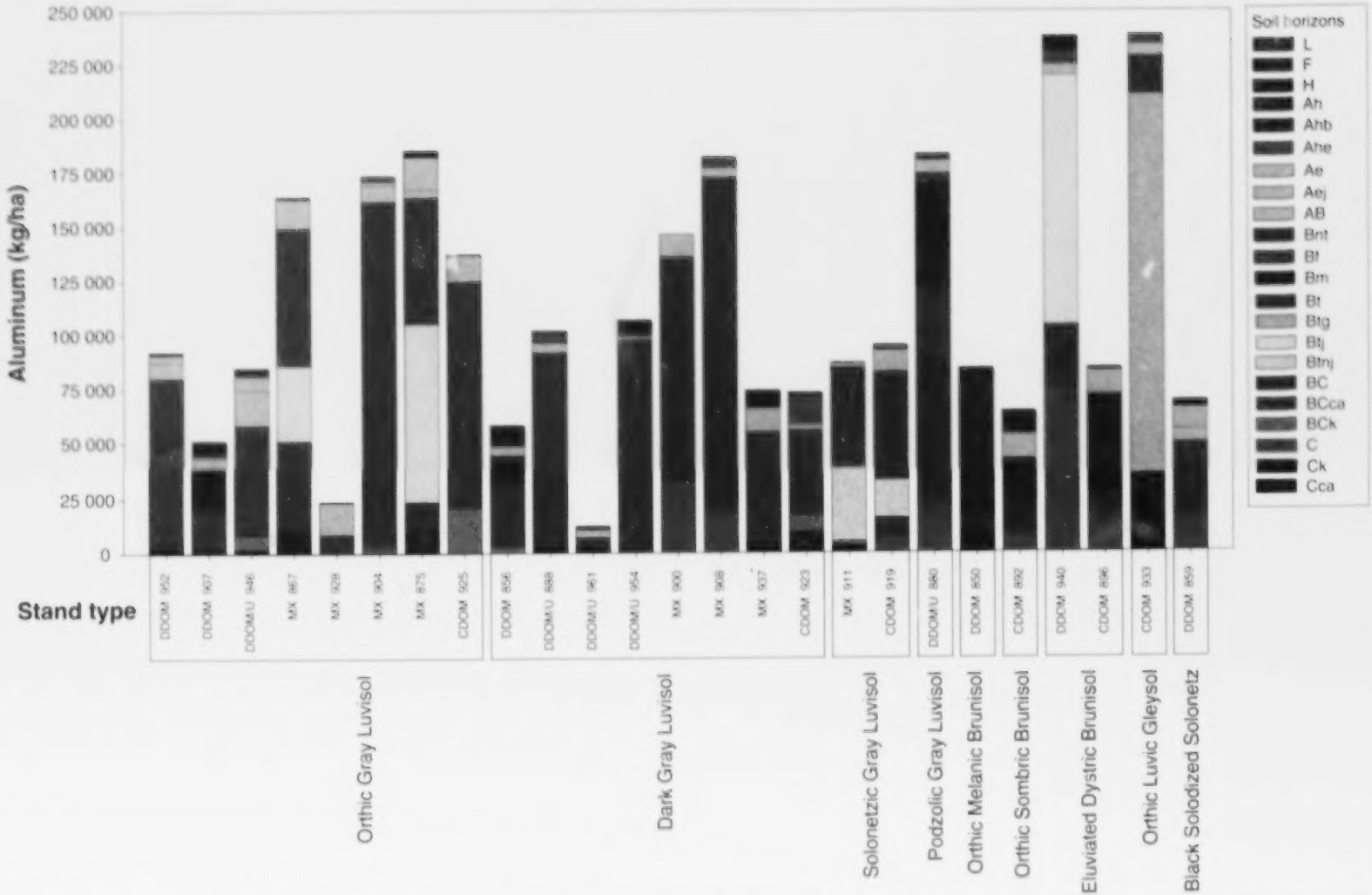

Figure 16. Distribution of aluminum in soil profiles, by horizon. Forest floor values are total digestible and mineral soil values are sodium pyrophosphate extractable. Subdivided horizons within a profile (e.g., Bt1, Bt2) are combined and presented as a single horizon (e.g., Bt). Compartments are ordered by soil subgroup and stand types within subgroups and are identified by compartment number. DODM = deciduous dominant, DDOM/U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

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APPENDIX 1

Properties of Soil Orders Present in the Ecosystem Management Emulating Natural Disturbance Experimental Area

Information in this appendix is based on Valentine et al. (1986) and Soil Classification Working Group (1998).

Luvisolic Order

Includes Orthic Gray Luvisol, Dark Gray Luvisol, Solonetzic Gray Luvisol, and Podzolic Gray Luvisol.

Soils in the Luvisolic Order (Luvisols) are formed under deciduous, mixed coniferous deciduous, or boreal forest cover. They are found in climatic conditions where there is sufficient precipitation to allow weathering and leaching of soil constituents, but where evapotranspiration may be limited by cool temperatures. They are generally formed on fine- to medium-textured materials.

The parent materials are usually neutral to slightly alkaline. The dominant soil-forming processes are the translocation of clay-sized mineral particles in suspension from the A to the B horizon and the accumulation of clay materials in the B horizon. This clay accumulation can cause restrictions in water infiltration and root penetration. Other processes occurring in Luvisolic soils are accumulation of organic materials at the soil surface to form the forest floor, weathering of mineral constituents in the A and B horizons, and leaching of soluble salts and carbonates into the C horizon.

Brunisolic Order

Includes Orthic Melanic Brunisol, Orthic Sombric Brunisol, and Eluviated Dystric Brunisol.

Soils in the Brunisolic Order (Brunisols) are also formed under forest cover but are less developed than Luvisolic soils. They are transitional to more developed orders, their development being limited by a number of factors, including low temperature, limited moisture, coarse parent materials, and limited time of development. The processes of soil development are evident but not manifest to the extent characteristic of other orders.

The predominant processes involved in the formation of Brunisols are the leaching of soluble salts and carbonates, in situ weathering of the mineral fraction and formation of secondary minerals, and development of soil structure.

Gleysolic Order

Includes Orthic Luvic Gleysol.

Soils in the Gleysolic Order (Gleysols) undergo saturation for periods of the year, principally because of topographical restrictions in drainage. Fine-textured parent materials also contribute to the development of Gleysolic soils by restricting drainage. Soil profiles show evidence of reducing conditions, in the dull gray colors of the B and C horizons, with patches of bright mottling above, where reduced iron compounds have become oxidized with seasonal aeration. In many cases, the surface horizons have large accumulations of organic matter, which are due to low rates of decomposition.

Solonetzic Order

Includes Black Solodized Solonetz.

Soils in the Solonetzic Order (Solonetz) are characterized by a high proportion of exchangeable sodium or sodium and magnesium salts in the B horizon. This feature results in certain morphologic and chemical properties and may restrict vegetation to more tolerant species.

High concentrations of sodium may result either from sodium-rich parent materials or the accumulation of salt-rich soil solution and the subsequent evaporation of surface moisture. The dominant processes are the accumulation of sodium and magnesium salts in the B horizon, the breakdown of normal soil morphology because of the relative proportion of sodium salts, and the formation of hard and impervious columnar structures.

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APPENDIX 2

Summary of Ecosite Classifications for the Ecosystem Management Emulating Natural Disturbance (EMEND) Experimental Area

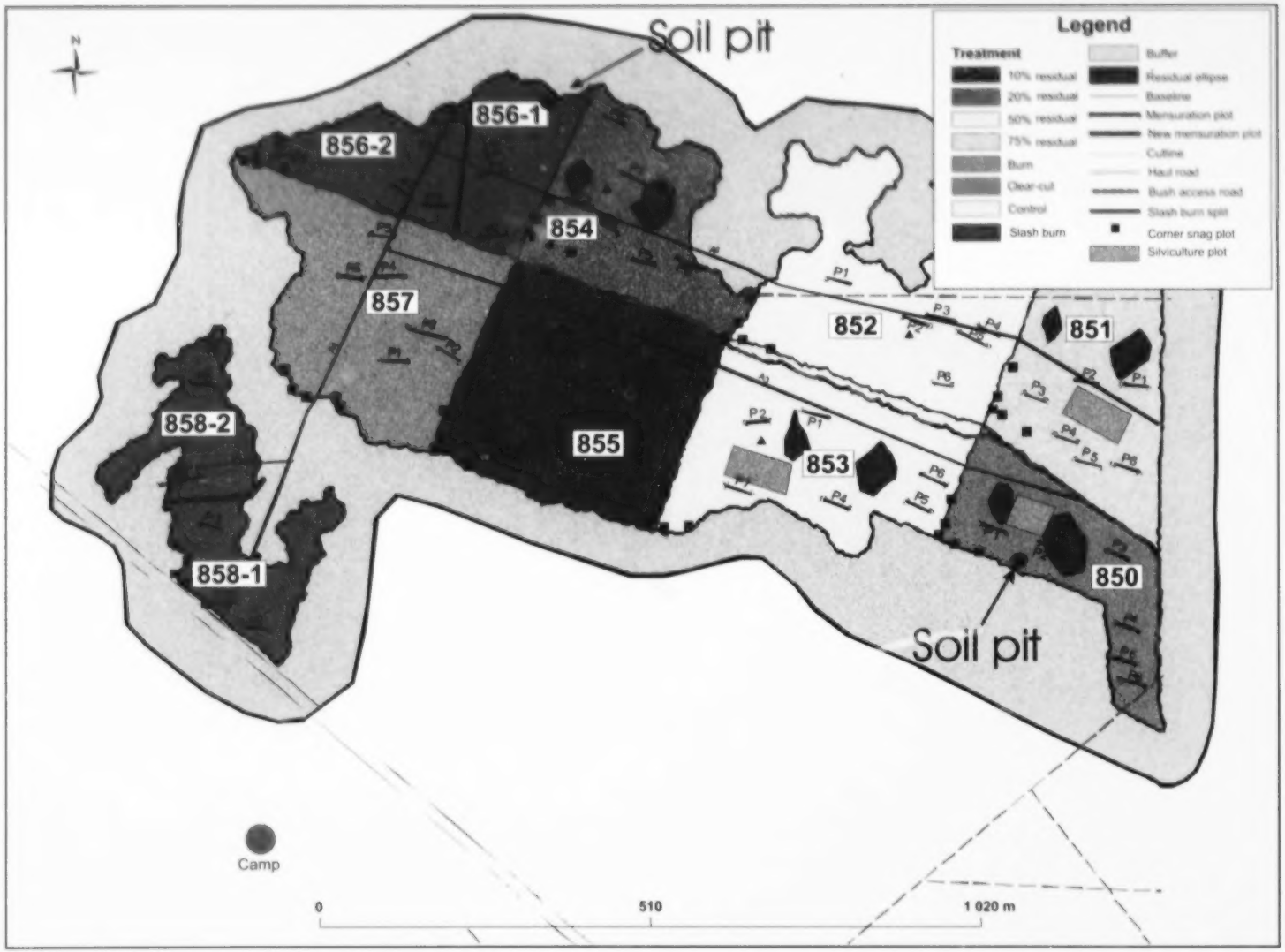
Ecosite classifications[a]

Stand type	Humus form	Moisture regime	Drainage class	Nutrient regime	Ecosite phase	Plant community type
DDOM	Mor	Mesic	Imperfect	Medium	e3	e3.4
DDOM	Mor	Hygric	Very poor	Medium	i3	i3.1
DDOM	Mor	Mesic	Moderately well	Medium	e3	e3.1
DDOM	Moder	Subhygric	Imperfect	Rich	e3	e3.3
DDOM	Moder	Subhygric	Imperfect	Rich	e3	e3.3
DDOM	Raw moder	Mesic	Moderately well	Rich	e3	e2.3/e2.5
DDOM	Mor	Mesic	Imperfect	Medium	e2	e2.4
DDOM	Mor	Mesic	Moderately well	Medium	e2	e2.4
DDOM	Raw moder	Mesic	Moderately well	Medium	e2	e2.3/e2.4
DDOM/U	Raw moder	Mesic	Moderately well	Rich	e3	e3.1
DDOM/U	Raw moder	Mesic	Imperfect	Medium	e3	e3
DDOM/U	Mor	Subhygric	Imperfect	Medium	e3	e3.3/e3.4
DDOM/U	Mor	Subhygric	Imperfect	Poor	e3	e3.4
DDOM/U	Mor	Subhygric	Imperfect	Medium	e3	e3.4
DDOM/U	Mor	Subhygric	Imperfect	Medium	e3	e3.1
DDOM/U	Mor	Mesic	Imperfect	Medium	e3	e3.3
MX	Moder	Mesic	Moderately well	Medium	e3	e3.2/e3.3
MX	Mor	Mesic	Moderately well	Medium	e3	e3.3
MX	Mor	Subhygric	Imperfect	Medium	e3	e3.3
MX	Raw moder	Mesic	Moderately well/ imperfect/	Medium	e3	e3.4
MX	Mor	Subhygric	Imperfect	Medium	e3	e3.4
MX	Mor	Hygric	Poor	Medium	j1	j1.1
MX	Mor	Subhygric	Imperfect	Medium	e4	e4.2/e4.5
CDOM	Mor	Subhygric	Imperfect	Medium	i3	i3.1
CDOM	Mor	Mesic	Moderately well	Medium	e4	e4.3
CDOM	Mor	Subhygric	Imperfect	Medium	e4	e4.2/e4.5
CDOM	Mor	Mesic	Moderately well	Medium	e3	e3.3
CDOM	Mor	Mesic	Moderately well/ imperfect	Medium	e4	e4.2/e4.5
CDOM	Mor	Mesic	Moderately well	Medium	e3	e3.6
CDOM	Mor	Subhygric	Imperfect	Medium	e4	e4.3

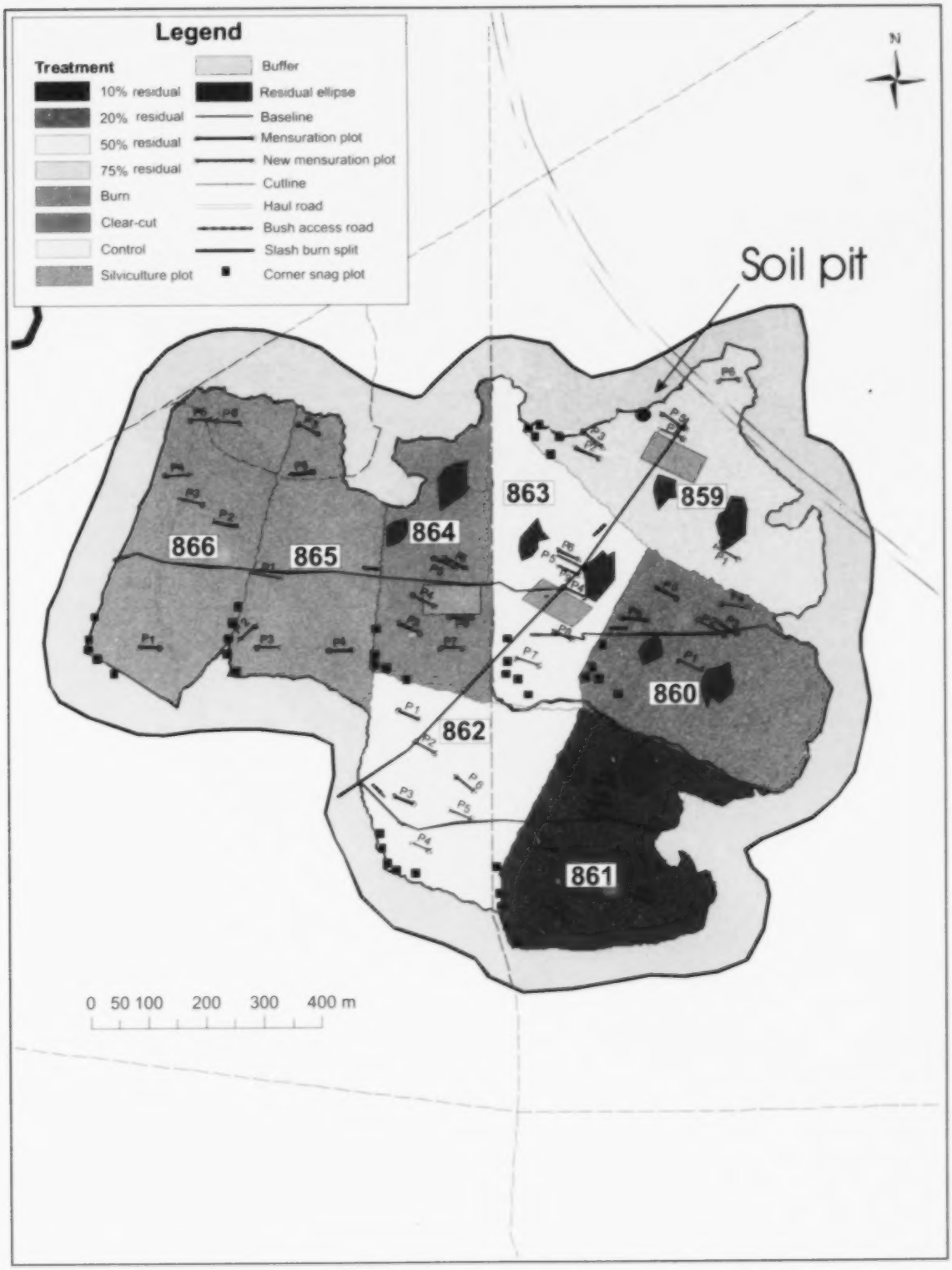
[a]Ecosite classifications are based on Beckingham, J.D.; Corns, I.G.W.; Archibald, J.H. 1996. Field guide to ecosites of west-central Alberta. Nat. Resour. Can., Can. For. Serv., Northwest Reg., North. For. Cent., Edmonton, Alberta. Spec. Rep. 9.
Classifications were completed by staff of the EMEND partners in 1998 and 1999 (D. Sidders, Canadian Forest Service, Edmonton, Alberta, personal communication, December 2003, meeting at Northern Forestry Centre).
Note: DDOM = deciduous dominant, DDOM/U = deciduous dominant with coniferous understory, MX = mixed deciduous and coniferous, CDOM = coniferous dominant.

APPENDIX 3

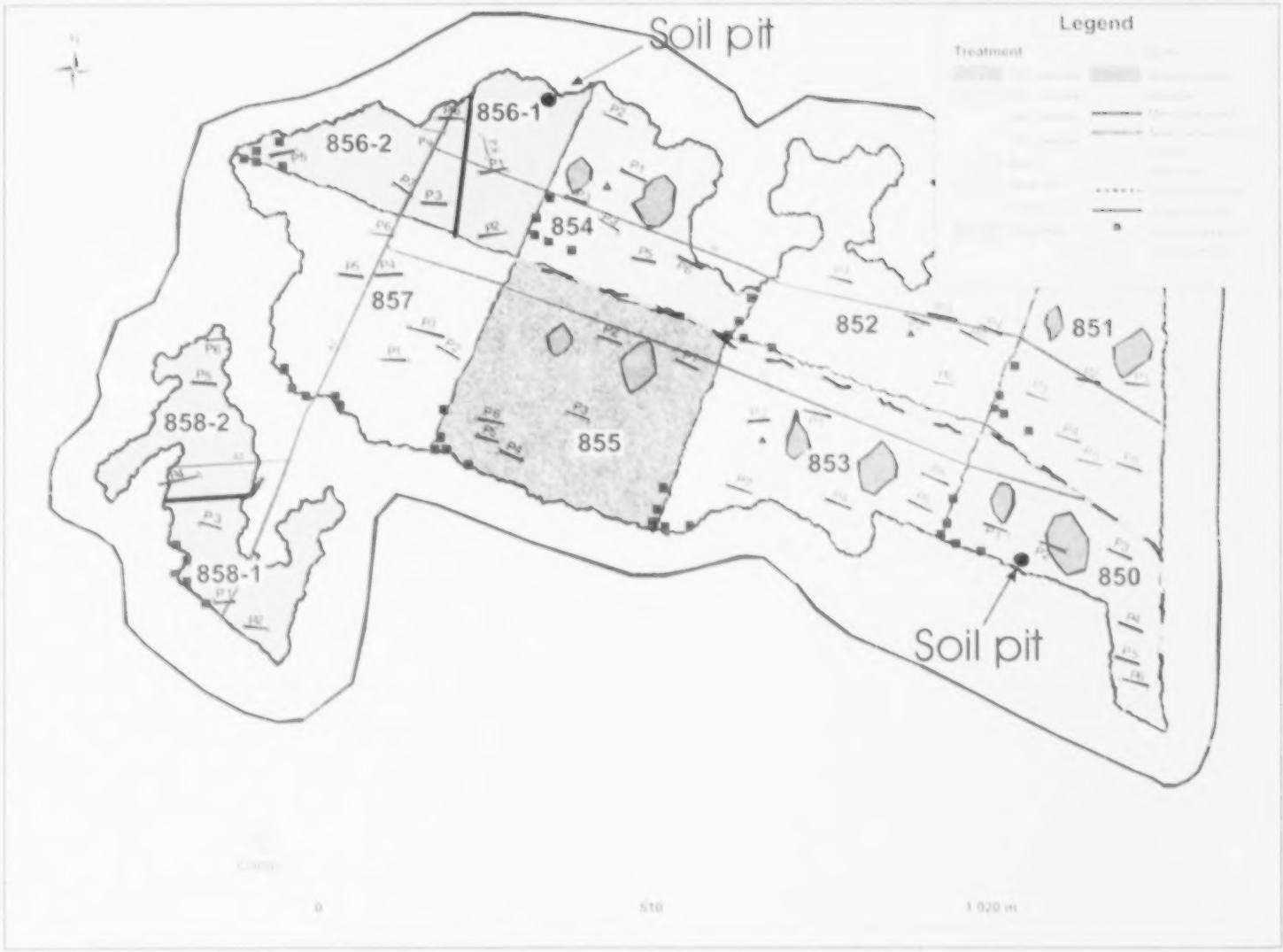
Maps of Research Blocks in the Ecosystem Management Emulating Natural Disturbance Experimental Area, Showing Location of Soil Pits within Compartments



Research block A (deciduous dominant, stand 77 replicate 1).

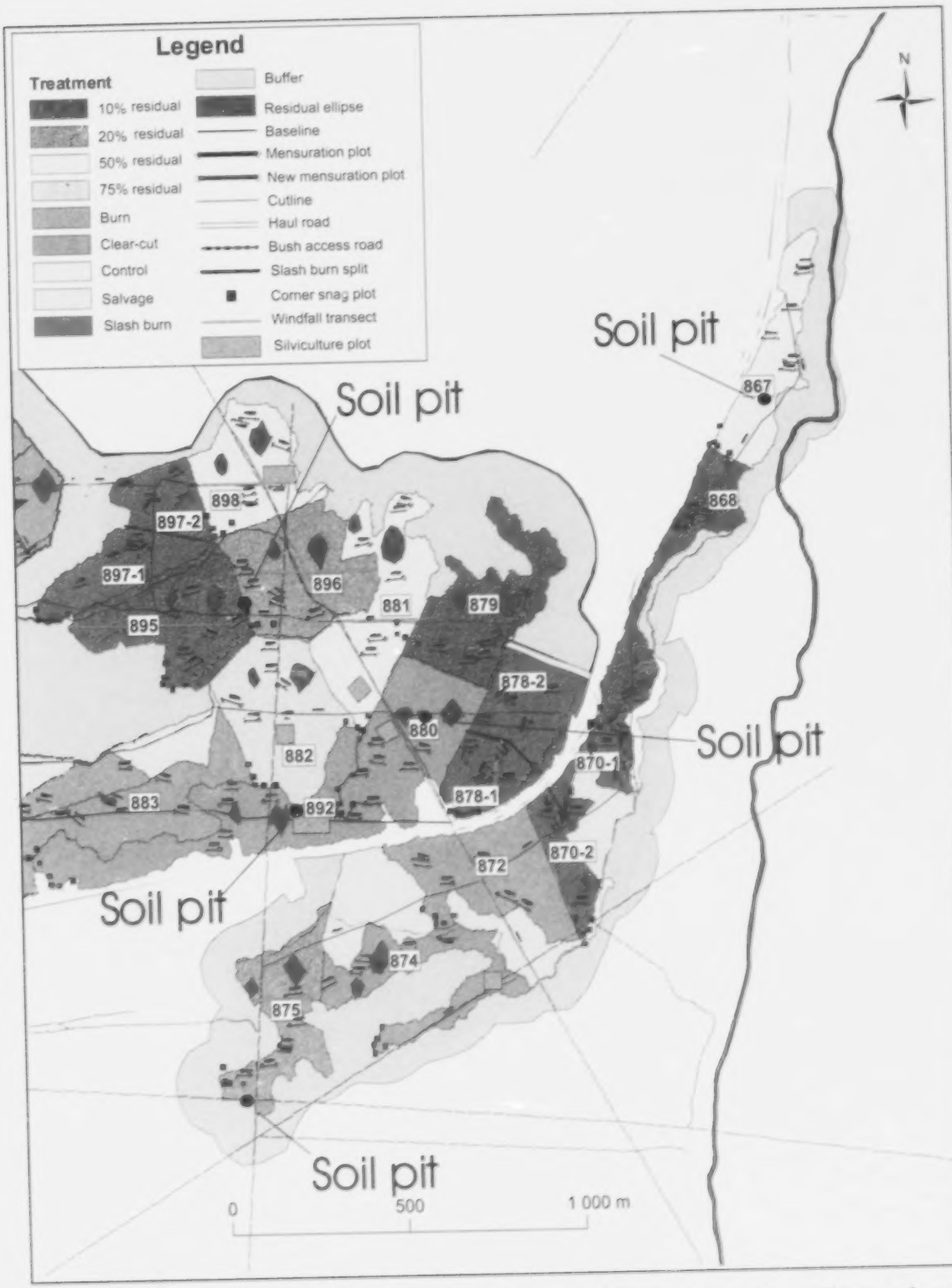


Research block B (deciduous dominant, stand 66 replicate 2).

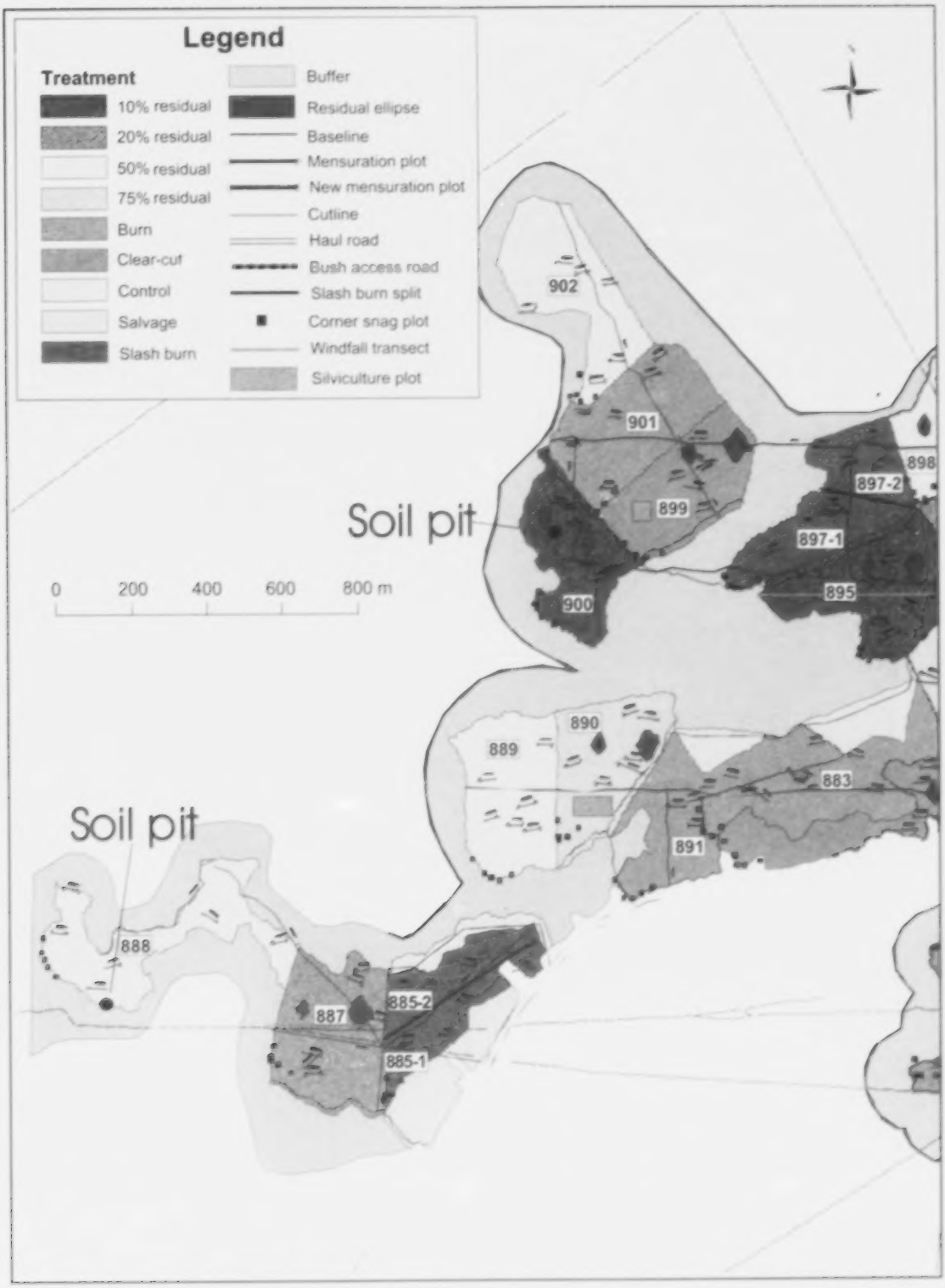


Research block A (deciduous dominant, stand 77 replicate 1).

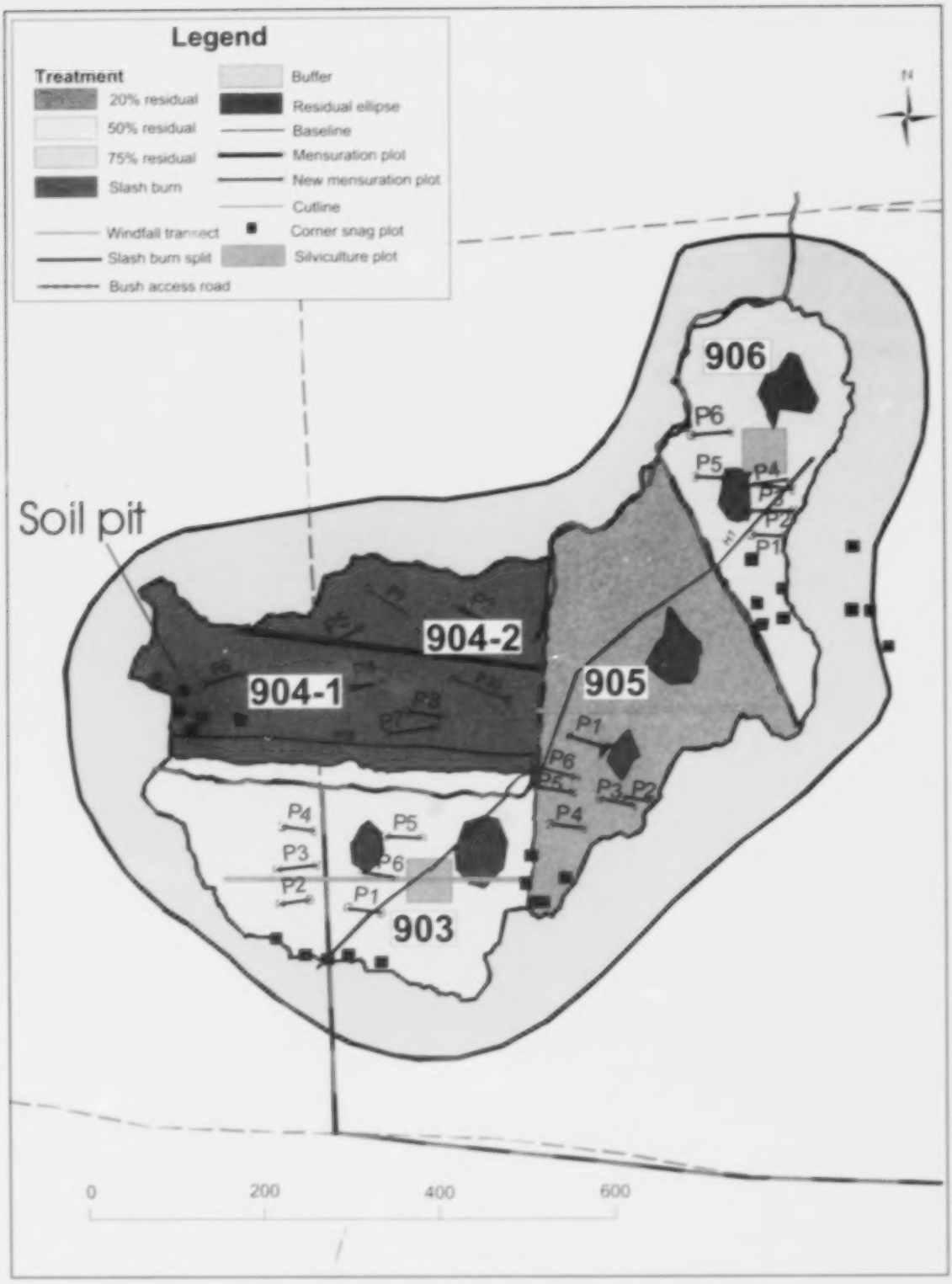
Research block B (deciduous dominant, stand 66 replicate 2).



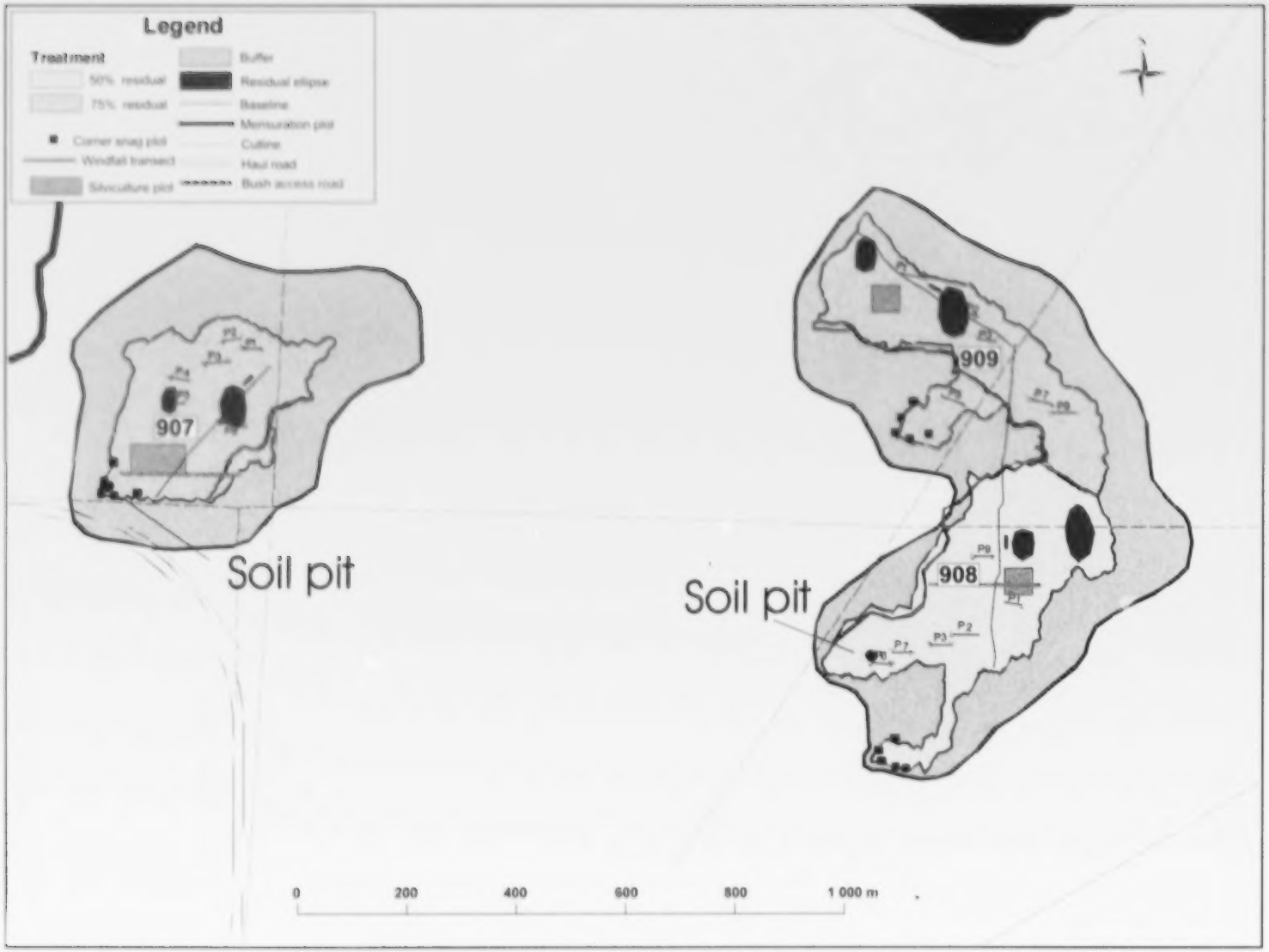
Research block C (coniferous dominant, stand 43 replicate 1; deciduous dominant with coniferous understory, stand 42 replicate 1; mixed deciduous and coniferous, stand 44 replicate 3 and stand 49 replicate 3).



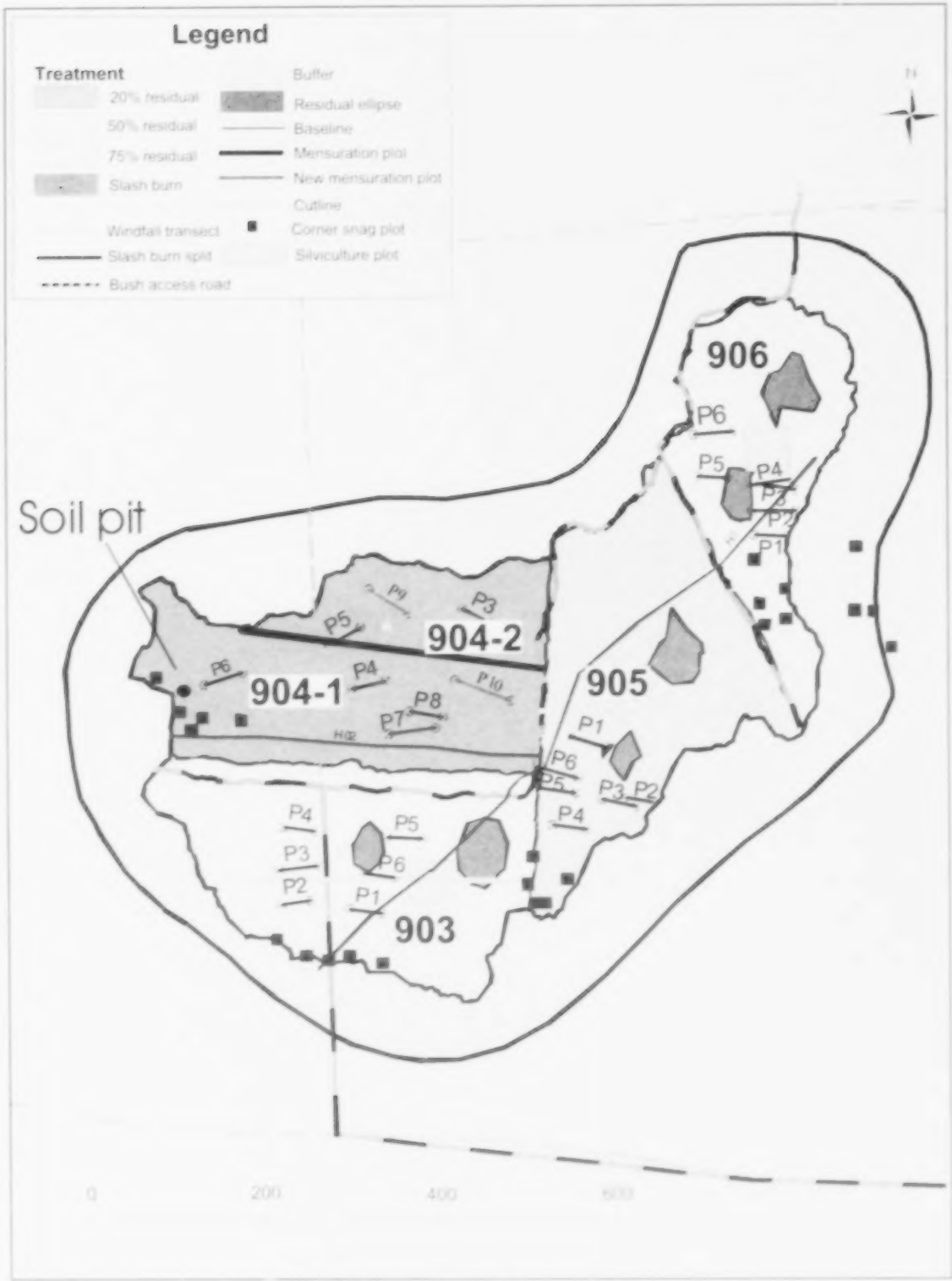
Research block D (deciduous dominant with coniferous understory, stand 5 replicate 1; coniferous dominant, stand 31 replicate 1; mixed deciduous and coniferous, stand 29 replicate 2).



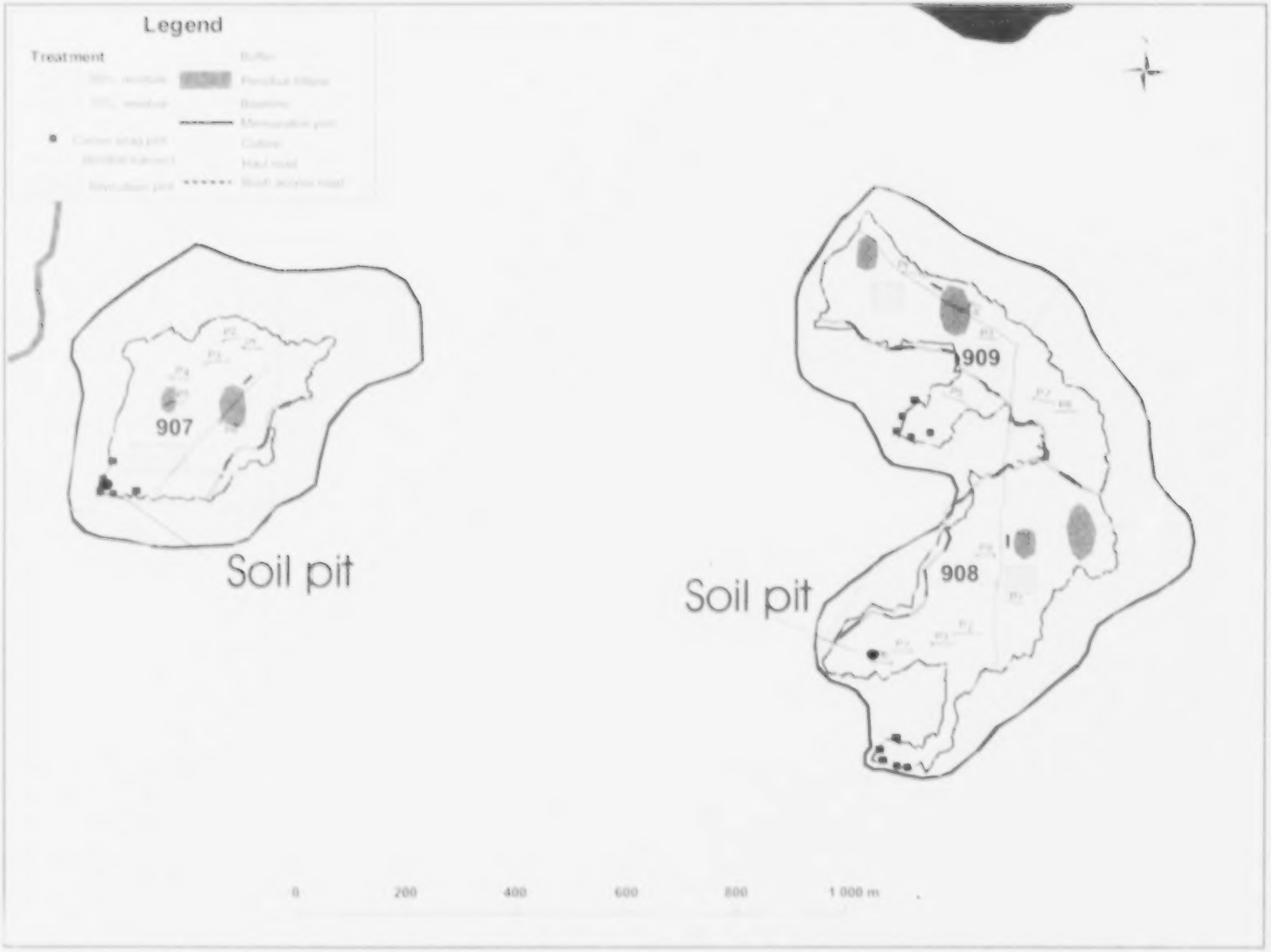
Research block E (mixed deciduous and coniferous, stands 201 and 202 replicate 2).



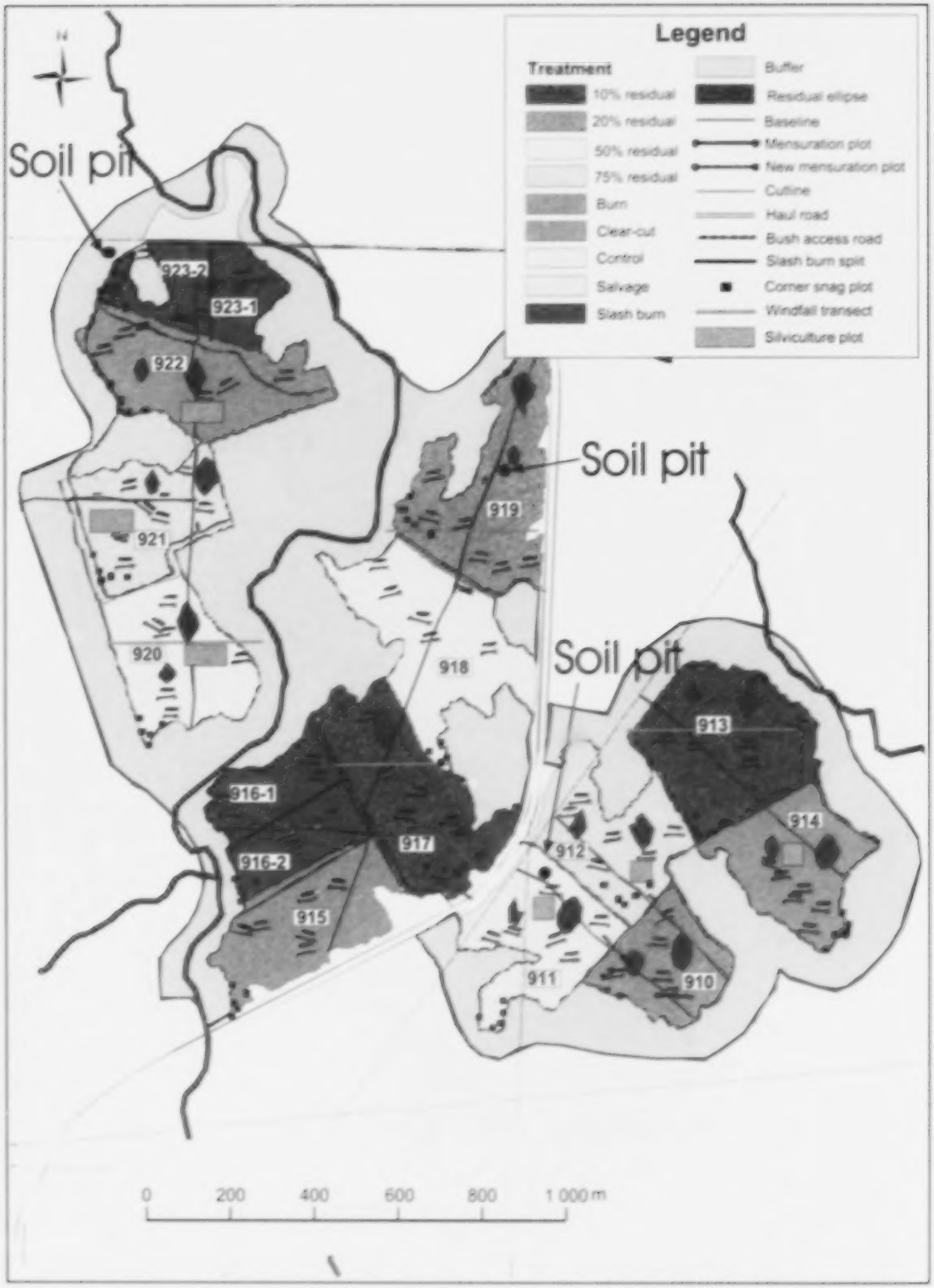
Research block F (deciduous dominant, stand 121 replicate 3; mixed deciduous and coniferous, stands 254 and 9104 replicate 3).



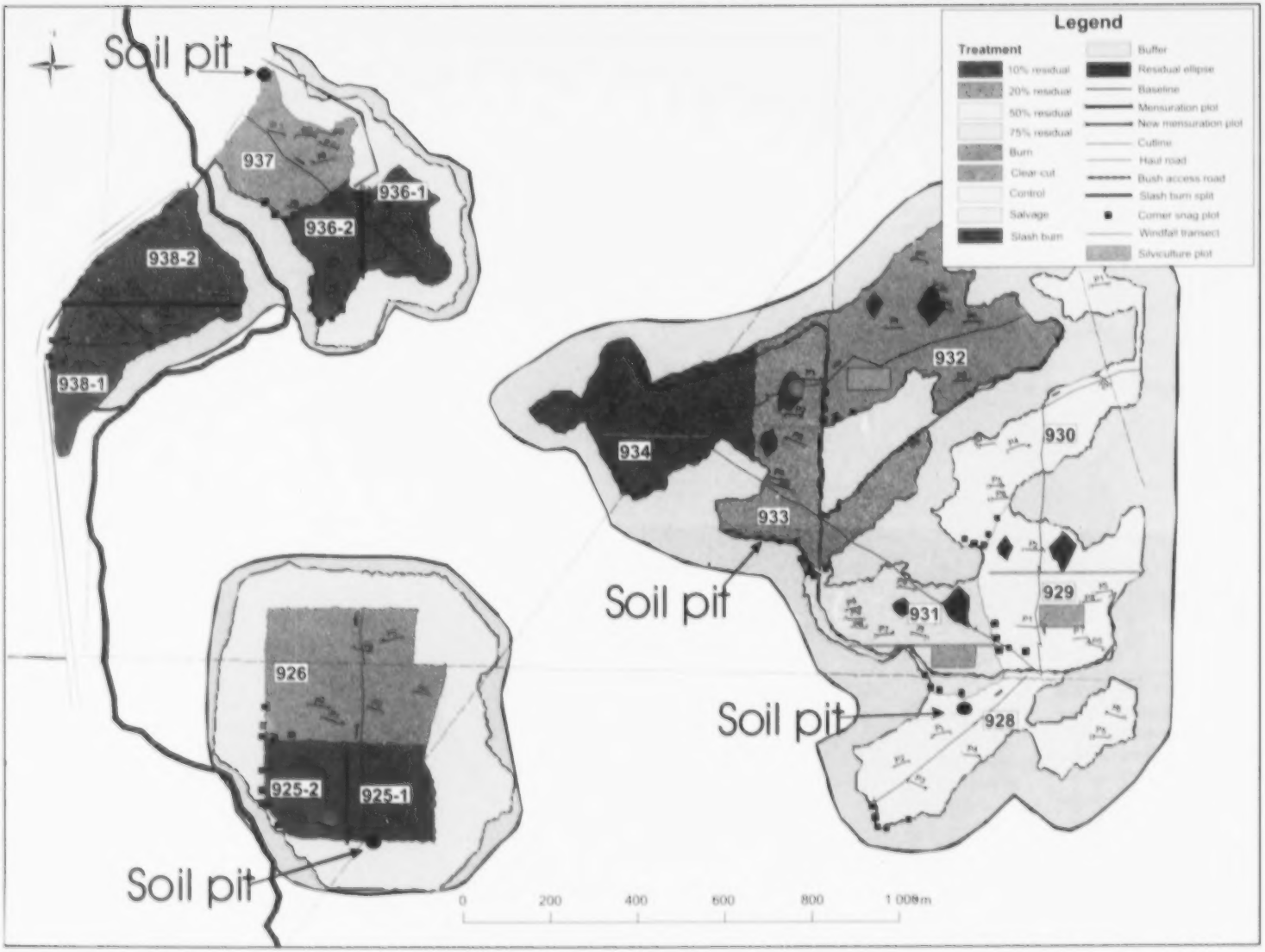
Research block E (mixed deciduous and coniferous, stands 201 and 202 replicate 2).



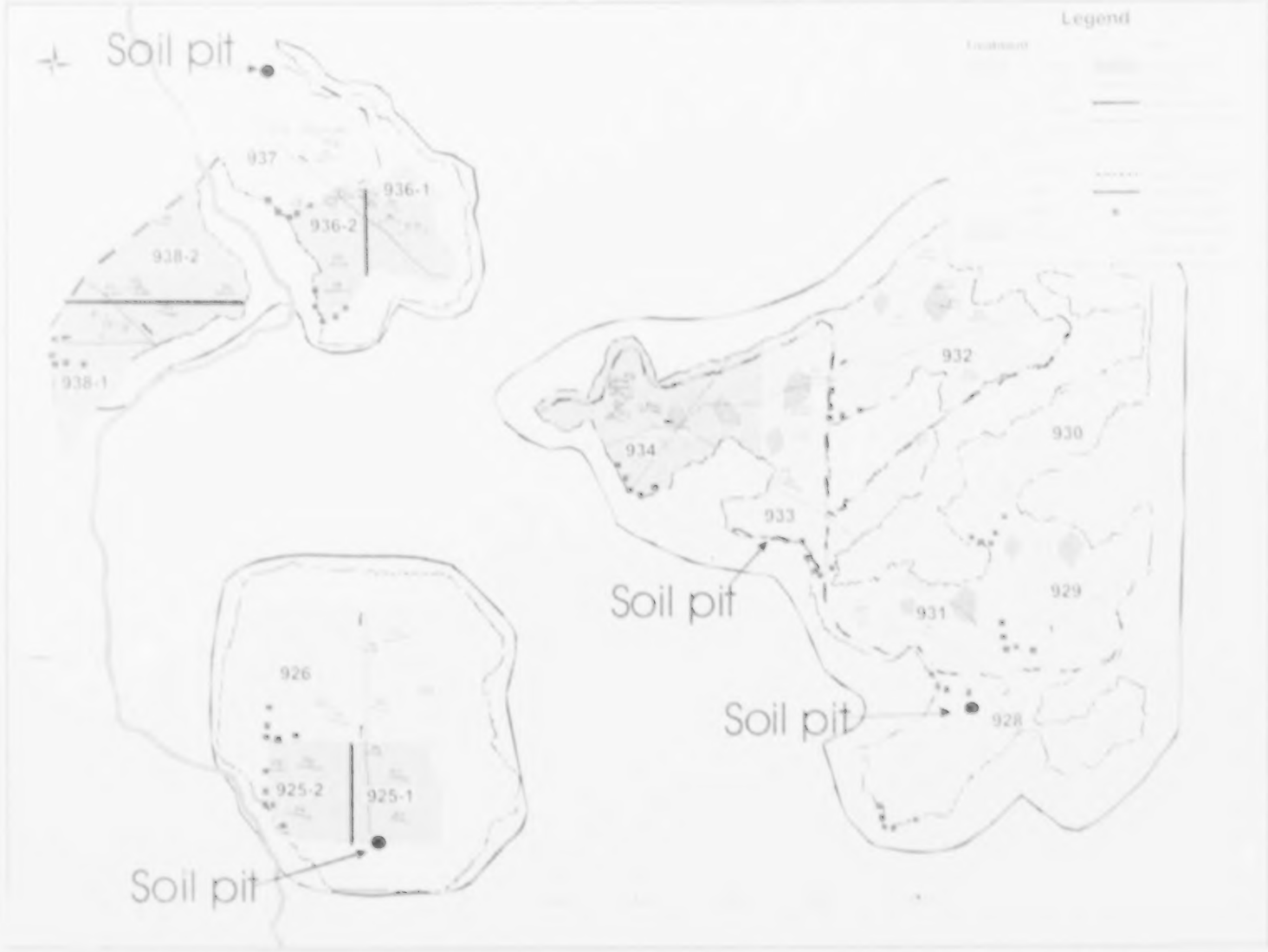
Research block 1 (deciduous dominant, stand 121 replicate 3; mixed deciduous and coniferous, stands 254 and 9104 replicate 3).



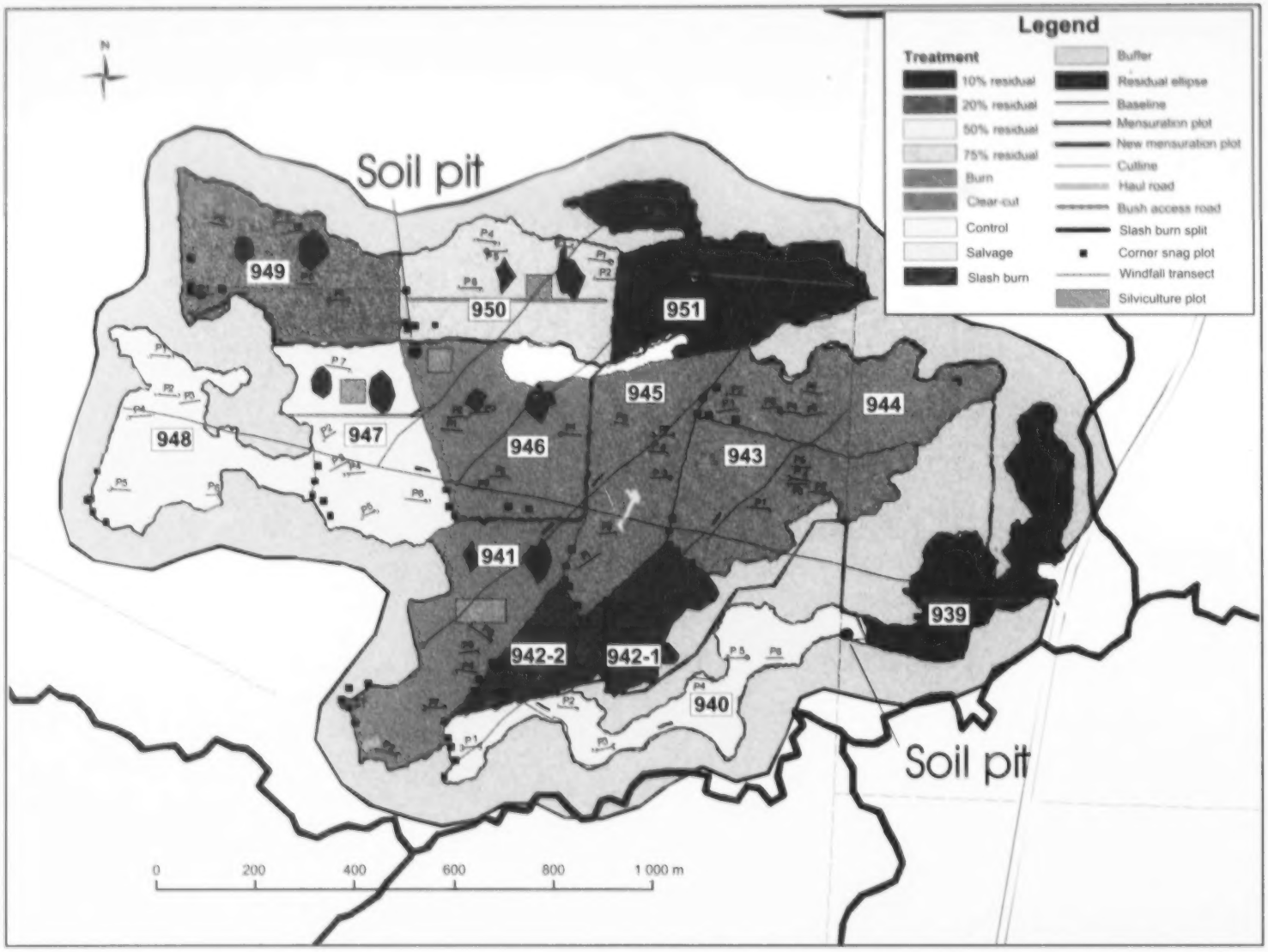
Research block G (coniferous dominant, stand 314 replicate 2; mixed deciduous and coniferous, stand 303 replicate 1).



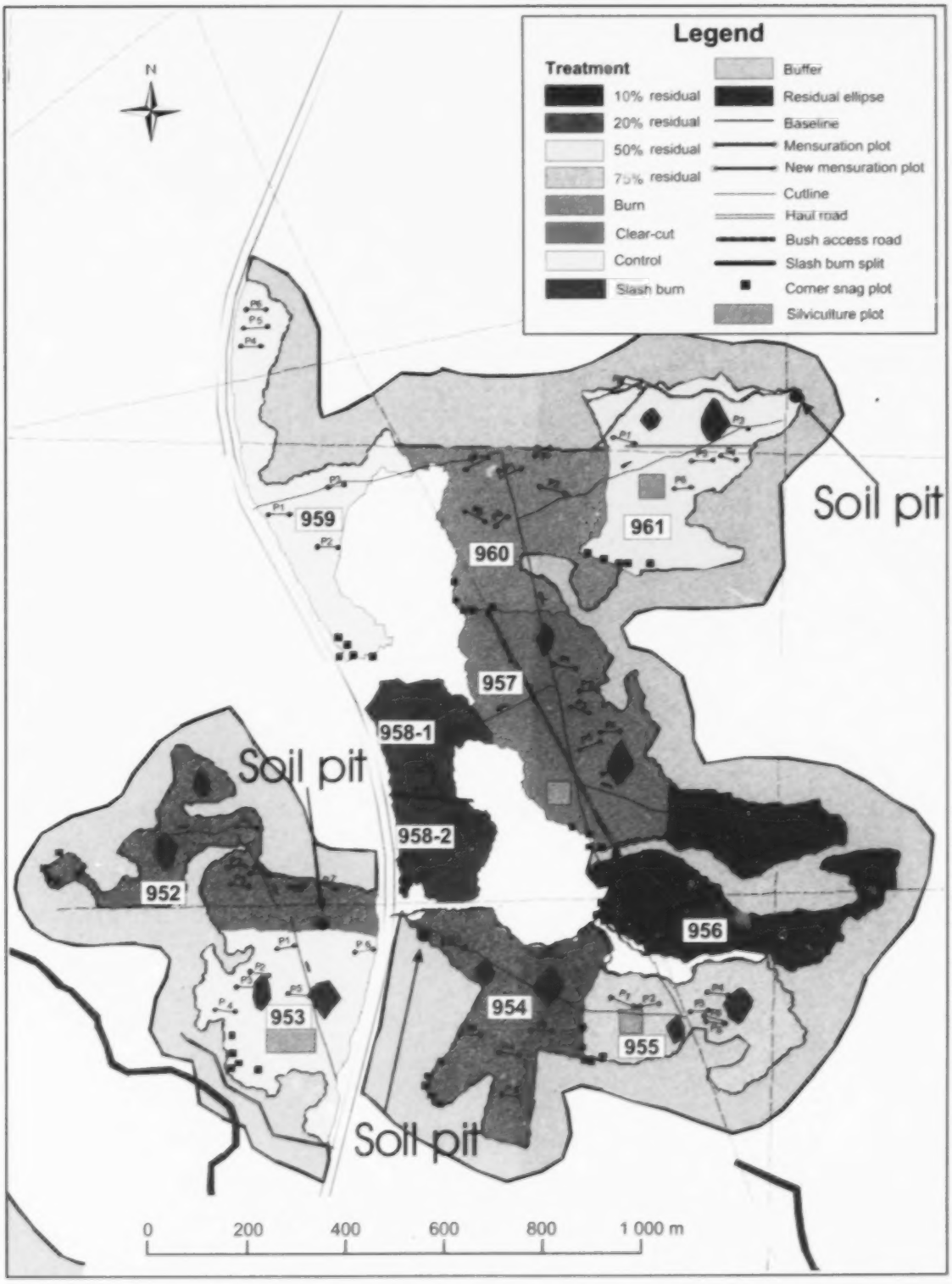
Research block H (mixed deciduous and coniferous, stands 423 and 284 replicate 1; coniferous dominant, stands 306 and 445 replicate 3).



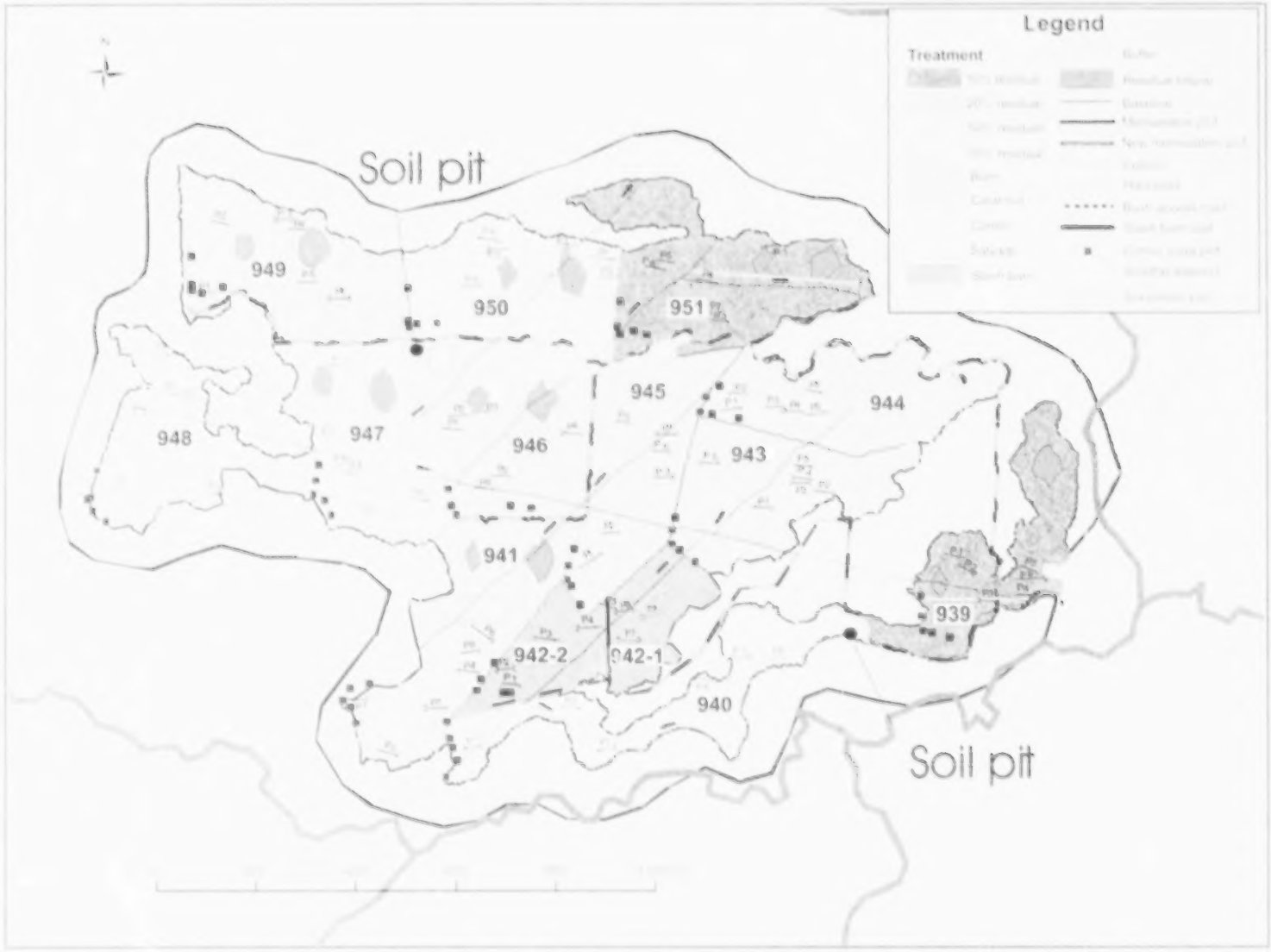
Research block II (mixed deciduous and coniferous, stands 423 and 284 replicate 1; coniferous dominant, stands 306 and 445 replicate 3).



Research block I (deciduous dominant with coniferous understory, stands 9488, 481, and 9493 replicate 3; deciduous dominant, stand 9481 replicate 3).



Research block J (deciduous dominant, stand 582 replicate 3; deciduous dominant with coniferous understory, stand 9601 replicate 2).



Research block 1 (deciduous dominant with coniferous understory, stands 9488, 481, and 9493 replicate 3; deciduous dominant, stand 9481 replicate 3).

Research block 3 (deciduous dominant, stand 582 replicate 3; deciduous dominant with coniferous understory, stand 9601 replicate 2).

APPENDIX 4

Soil Profile Descriptions by Horizon, with Compartments Grouped by Soil Subgroup and Stand Types within Subgroups

Soil profile description for compartment 952, Orthic Gray Luvisol, deciduous dominant (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	8–6	
F	6–2	
H	2–0	
Ae	0–10	Pale yellow (2.5Y 7/3); silt loam; moderate, medium platy; friable consistence; plentiful coarse roots
AB	10–20	Grayish brown (2.5Y 5/2); clay/clay loam; strong, fine subangular blocky; firm consistence; plentiful fine roots
Bt1	20–46	Very dark grayish brown (2.5Y 3/2); clay; strong, medium angular blocky; very firm consistence; plentiful very fine roots
Bt2	46–60	Dark olive gray (5Y 3/2); clay; moderate, fine subangular blocky; firm consistence; plentiful coarse roots
Bt3	60–88	Dark olive gray (5Y 3/2); clay; moderate to weak, medium subangular blocky; firm consistence; few fine roots; 10% coarse fragments
BCca	88–96	Dark olive gray (5Y 3/2); clay; moderate, medium subangular blocky; friable consistence; few very fine roots ; <10% coarse fragments
Ck	96–110+	Dark olive gray (5Y 3/2); clay; moderate, fine subangular blocky; friable consistence; 20% coarse fragments

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Ref. Rep. NOR-X-297

Soil profile description for compartment 907, Orthic Gray Luvisol, deciduous dominant (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	13–12	
F	12–2	
H	2–0	
Ah	0–4	Black (7.5YR 2.5/1); clay; weak, fine subangular blocky; very friable consistence; plentiful coarse roots
Ahe	4–8	Light olive brown (2.5Y 5/3); clay; weak, few subangular blocky; very friable consistence; few very fine roots
Ae	8–28	Light olive brown (2.5Y 5/3); sandy clay loam; weak, coarse subangular blocky; friable consistence; plentiful medium roots; 25% coarse fragments
Bm	28–52	Very dark grayish brown (10YR 3/2); loam; moderate, fine subangular blocky; firm consistence; plentiful coarse roots; <10% coarse fragments
Bt	52–68	Dark grayish brown (2.5Y 4/2); clay; moderate, coarse subangular blocky; friable consistence; few medium roots; 15% coarse fragments
BC	68–97	Dark grayish brown (10YR 4/2); clay; moderate, fine subangular blocky; friable consistence; few very fine roots; 20% coarse fragments
Cca	97–110+	Dark olive gray (5Y 3/2); clay loam; weak, fine subangular blocky; friable consistence; few fine roots; 10% coarse fragments

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52., Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 946, Orthic Gray Luvisol, deciduous dominant with coniferous understory (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	7–6	
F	6–0	
Ah	0–4	Black (10YR 2/1); clay; medium subangular blocky; friable consistence; plentiful very fine roots
Ahe	4–6	Very dark brown (7.5YR 2.5/2); silt loam; moderate, medium subangular blocky; friable consistence; plentiful very fine roots
Ae	6–17	Olive (5Y 5/3); silt loam; strong, very coarse platy; friable consistence; very few fine roots
AB	17–33	Grayish brown (2.5Y 5/2); silty clay; strong, coarse subangular blocky; firm to very firm consistence; few fine roots
Bt1	33–44	Very dark grayish brown (10YR 3/2); heavy clay; strong, coarse subangular blocky; firm consistence; few fine roots; clay films present
Bt2	44–61	Very dark brown (7.5YR 2.5/2); heavy clay; strong, coarse subangular blocky; firm consistence; few fine roots; clay films present
BCk	61–81	Very dark brown (7.5YR 2.5/2); heavy clay; strong, fine subangular blocky; friable consistence; plentiful very fine roots; weak effervescence
Ck	81–94+	Very dark gray (10YR 3/1); clay; strong, coarse subangular blocky; firm consistence; 5% coarse fragments; weak effervescence

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 867, Orthic Gray Luvisol, mixed deciduous and coniferous (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	14–12	
F	12–5	
H	5–0	
Ae	0–7	Brown (10YR 4/3); clay; strong, fine subangular blocky; very firm consistence; plentiful fine roots
Bt1	7–17	Very dark grayish brown (2.5Y 3/2); heavy clay; strong, fine subangular blocky; very firm consistence; very few coarse roots; clay films present
Bt2	17–37	Dark gray (2.5Y 4/1); heavy clay; strong, very fine subangular blocky; firm consistence; few fine roots; clay films present
Btj	37–57	Very dark grayish brown (2.5Y 3/2); clay/heavy clay; strong, very fine subangular blocky; very friable consistence; few fine roots
BC	57–85	Olive gray (5Y 4/2); clay; weak, medium subangular blocky; friable consistence; few fine roots
Ck	85–93+	Dark grayish brown (2.5Y 4/2); clay/heavy clay; weak to moderate, fine subangular blocky; very friable consistence

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B.C. Minist. Environ. and B.C. Minist. For., Victoria, BC.

Soil profile description for compartment 928, Orthic Gray Luvisol, mixed deciduous and coniferous (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	16–15.5	
F	15.5–3.5	
H	3.5–0	
Ahe	0–4	Highly variable and discontinuous
Ae	4–22	Dark grayish brown (10YR 4/2); silty clay loam; strong, fine subangular blocky; very friable consistence; plentiful coarse roots
Bt1	22–40	Olive gray (5Y 4/2); heavy clay; moderate, fine subangular blocky; very firm consistence; few fine roots
Bt2	40–70	Olive gray (5Y 4/2); clay; strong, very fine subangular blocky; firm consistence; few very fine roots
BCk1	70–87	Very dark grayish brown (2.5Y 3/2); clay; weak, very fine subangular blocky; very friable consistence; few very fine roots; 40% coarse fragments; strong effervescence
BCk2	87–115+	Olive brown (2.5Y 4/3); clay; moderate, medium subangular blocky; very friable consistence; 15% coarse fragments; moderate to strong effervescence

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B.C. Minist. Environ. and B.C. Minist. For., Victoria, BC.

Soil profile description for compartment 904, Orthic Gray Luvisol, mixed deciduous and coniferous (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	10–9	
F	9–1	
H	1–0	
Ahe	0–3	Dark brown (10YR 3/3); clay/clay loam; weak, fine subangular blocky; friable consistence; abundant coarse roots
Ae	3–9	Light gray (2.5Y 7/2); clay loam; weak to moderate, coarse platy; very firm consistence; plentiful very fine roots
AB	9–17	Yellowish brown (10YR 5/6); clay; moderate, medium subangular blocky; very firm consistence ; few fine roots
Bt1	17–45	Olive brown (2.5Y 4/3); clay/heavy clay; moderate, fine columnar; firm consistence; plentiful medium roots; <5% coarse fragments
Bt2	45–69	Olive brown (2.5Y 4/3); clay; weak to moderate, coarse subangular blocky; firm consistence; few fine roots; <5% coarse fragments
BC	69–98	Black (2.5Y 2.5/1); clay; moderate, coarse subangular blocky; firm consistence; few very fine roots; <5% coarse fragments
C	98–114+	Very dark grayish brown (2.5Y 3/2); clay; moderate, coarse subangular blocky; friable consistence; <5% coarse fragments; effervescence present

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52., Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 875, Orthic Gray Luvisol, mixed deciduous and coniferous (imperfectly drained)

Horizon[a]	Depth (cm)	Soil description[b]
F	14–0	
Ah	0–4	No description available
Aej	4–9	Light brownish gray (10YR 6/2); clay; moderate, medium platy; friable consistence; plentiful coarse roots
Ae	9–20	Grayish brown (2.5Y 5/2); clay loam; moderate, fine subangular blocky; friable consistence; plentiful medium roots
Btj	20–41	Dark olive gray (5Y 3/2); silty clay loam; weak, coarse subangular blocky; friable consistence; few fine roots; <10% coarse fragments
Bt	41–63	Very dark grayish brown (2.5Y 3/2); clay; moderate, very fine subangular blocky; friable consistence; few very fine roots; clay films present
BC	63–79	Black (5Y 2.5/2); clay; weak, coarse subangular blocky; friable consistence
Cca	79–91	Olive gray (5Y 4/2); clay; moderate, fine subangular blocky; very friable consistence; 10% coarse fragments

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 925, Orthic Gray Luvisol, coniferous dominant (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	10–9	
F	9–2	
H	2–0	
Ahe	0–1	Grayish brown (2.5Y 5/2)
Ae	1–13	Pale yellow (2.5Y 7/3); clay loam; moderate, fine subangular blocky; firm consistence; plentiful coarse roots;
Bt1	13–29	Olive gray (5Y 4/2); clay; strong, fine angular blocky; very firm consistence; few fine roots
Bt2	29–57	Olive brown (2.5Y 4/3); clay; strong, fine subangular blocky; very firm consistence; few medium roots; 5% coarse fragments
Bt3	57–93	Very dark grayish brown (2.5Y 3/2); clay; moderate to strong, coarse subangular blocky; firm consistence; few fine roots; 5% coarse fragments
BCk	93–117+	Dark olive gray (5Y 3/2); clay; weak to moderate, coarse subangular blocky; firm consistence; 5% coarse fragments; weak to moderate effervescence

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52., Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 856, Dark Gray Luvisol, deciduous dominant (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	15–11	
F	11–2	
H	2–0	
Ae	0–2	
Ah	2–10	Black (10YR 2/1); clay/clay loam
Aej	10–13	Olive brown (2.5Y 4/4); clay; strong, fine granular; very friable consistence; plentiful coarse roots
Bm	13–30	Light olive brown (2.5Y 5/4); clay loam; moderate, fine granular; friable consistence; plentiful medium roots
Bt1	30–51	Dark olive gray (5Y 3/2); clay; moderate, fine subangular blocky; very friable consistence; plentiful medium roots; 10% coarse fragments
Bt2	51–65	Very dark grayish brown (2.5Y 3/2); clay; strong, fine subangular blocky; friable consistence; few fine roots; 5% coarse fragments
BCk	65–89+	Olive gray (5Y 4/2); clay; strong, fine subangular blocky; firm consistence; few fine roots; 5% coarse fragments; moderate effervescence

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52., Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 888, Dark Gray Luvisol, deciduous dominant with coniferous understory (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	11–10	
F	10–3	
H	3–0	
Ahe	0–7	Black (10YR 2/1); silty clay loam; moderate, coarse subangular blocky; friable consistence; few coarse roots
Ae	7–15	Pale yellow (2.5Y 8/2); silty clay loam; weak, fine platy; friable consistence; plentiful coarse roots
Bt1	15–35	Olive gray (5Y 4/2); clay; strong, medium subangular blocky; very firm consistence; few fine roots
Bt2	35–58	Dark olive gray (5Y 3/2); heavy clay; strong, fine angular blocky; very firm consistence; few fine roots
BC	58–83	Black (5Y 2.5/1); clay; moderate to strong, coarse subangular blocky; firm consistence; few fine roots; 10% coarse fragments
Ck	83–94+	Black (5Y 2.5/1); clay; weak to moderate, fine subangular blocky; friable consistence; few fine roots; 20% coarse fragments; effervescence present

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52., Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 961, Dark Gray Luvisol, deciduous dominant with coniferous understory (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	7–6	
F	6–2	
H	2–0	
Ahe	0–6	Very dark grayish brown (10YR 3/2); clay; weak, fine subangular blocky; friable consistence; plentiful very fine roots
Aej	6–14	Light olive brown (2.5Y 5/3); clay; weak, fine subangular blocky; friable consistence; plentiful medium roots
Bt1	14–30	Light olive brown (2.5Y 5/4); clay; strong, fine subangular blocky; very firm consistence; few fine roots
Bt2	30–59	Very dark grayish brown (2.5Y 3/2); clay; weak, coarse subangular blocky; firm consistence; few fine roots; 10% coarse fragments
BCk	59–84	Very dark grayish brown (2.5Y 3/2); clay; weak fine subangular blocky; friable consistence; few fine roots; <10% coarse fragments; weak effervescence
Ck	84–112+	Very dark grayish brown (2.5Y 3/2); clay; weak, medium subangular blocky; firm consistence; few very fine roots; 30% coarse fragments; strong effervescence

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52., Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 954, Dark Gray Luvisol, deciduous dominant with coniferous understory (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	6–4	
F	4–0	
Ah	0–10	Black (10YR 2/1); clay loam; weak, very fine subangular blocky; very friable consistence; plentiful coarse roots
Ahe	10–15	Grayish brown (2.5Y 5/2); sandy clay loam; weak, fine subangular blocky; friable consistence; plentiful medium roots; 30% coarse fragments
Ae	15–28	Pale yellow (2.5Y 7/3); loam; single grain; firm consistence; plentiful medium roots; 40% coarse fragments
Bt1	28–48	Dark gray (5Y 4/1); heavy clay; strong, fine prismatic; very firm consistence; plentiful medium roots; 5% coarse fragments
Bt2	48–65	Very dark gray (2.5Y 3/1); clay/heavy clay; strong, fine angular blocky; very firm consistence; few fine roots
Bt3	65–80	Dark olive gray (5Y 3/2); clay; strong, coarse subangular blocky; friable consistence; few very fine roots; 10% coarse fragments
BC	80–105+	Dark olive gray (5Y 3/2); clay; strong, medium subangular blocky; very firm consistence

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52., Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 900, Dark Gray Luvisol, mixed deciduous and coniferous (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	9–8	
F	8–0	
Ahe	0–6	
Ae	6–30	Light brownish gray (2.5Y 6/2); silty clay loam; weak, medium platy; friable consistence; plentiful coarse roots (some occurence of mixing with inconsistent Ahb horizon)
Bt1	30–52	Light olive brown (2.5Y 5/3); clay/heavy clay; weak, medium columnar; very firm consistence; plentiful very fine roots
Bt2	52–71	Olive brown (2.5Y 4/3); heavy clay; strong, medium subangular blocky; very firm consistence; few very fine roots
BC	71–93	Dark olive gray (5Y 3/2); heavy clay; strong, fine subangular blocky; firm consistence; plentiful coarse roots; 5% coarse fragments
C	93–108+	Dark olive gray (5Y 3/2); clay/heavy clay; strong, medium subangular blocky; very firm consistence; plentiful medium roots; 10% coarse fragments

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52., Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B.C. Minist. Environ. and B.C. Minist. For., Victoria, BC

Soil profile description for compartment 908, Dark Gray Luvisol, mixed deciduous and coniferous (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	10–9	
F	9–0	
Ahe	0–10	Dark grayish brown (10YR 4/2); clay; moderate, very fine subangular blocky; plentiful coarse roots
Ae	10–14	Light olive brown (2.5Y 5/3); clay; moderate, very fine subangular blocky; firm consistence; plentiful fine roots; 10% coarse fragments
Bt1	14–42	Grayish brown (2.5Y 5/2); heavy clay; strong, very fine subangular blocky; very firm consistence; plentiful coarse roots
Bt2	42–56	Dark grayish brown (10YR 4/2); clay; strong, very fine subangular blocky; firm consistence; few very fine roots; 5% coarse fragments
BC	56–96	Very dark grayish brown (2.5Y 3/2); clay; strong, fine subangular blocky; firm consistence
C	96–107+	Very dark grayish brown (2.5Y 3/2); clay; strong, fine subangular blocky; very firm consistence

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 937, Dark Gray Luvisol, mixed deciduous and coniferous (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
F	8–2	
H	2–0	
Ah	0–8	Very dark grayish brown (10YR 3/2); clay; moderate, coarse platy; friable consistence; plentiful coarse roots
Ae	8–17	Olive gray (5Y 5/2); clay; strong, medium subangular blocky; firm consistence; plentiful very fine roots
Bt1	17–27	Dark olive gray (5Y 3/2); clay; strong, coarse angular blocky; very firm consistence; few fine roots
Bt2	27–42	Very dark gray (5Y 3/1); clay; weak to moderate, medium subangular blocky; friable consistence; plentiful very fine roots; 5% coarse fragments
Bt3	42–66	Very dark grayish brown (2.5Y 3/2); heavy clay; strong, very fine subangular blocky; friable consistence; few very fine roots; <10% coarse fragments
Bt4	66–96	Very dark grayish brown (2.5Y 3/2); clay; weak, coarse subangular blocky; friable consistence; few very fine roots; clay films present
Ck	96–112+	Olive gray (5Y 4/2); clay; weak, coarse subangular blocky; friable consistence; 15% coarse fragments

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.
[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 923, Dark Gray Luvisol, coniferous dominant (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	14–13	
F	13–6	
H	6–0	
Ahe	0–12	Dark olive gray (5Y 3/2); clay; weak, fine subangular blocky; friable consistence; plentiful fine roots
Ae	12–22	Light gray (5Y 7/2); silty clay loam; moderate, fine angular blocky; friable consistence; few very fine roots
Bt1	22–31	Very dark grayish brown (2.5Y 3/2); clay; moderate, medium subangular blocky; friable consistence; few very fine roots; 50% coarse fragments
Bt2	31–52	Very dark grayish brown (2.5Y 3/2); clay; moderate, coarse subangular blocky; firm consistence; few very fine roots; 5% coarse fragments
Bt3	52–70	Olive gray (5Y 4/2); clay; weak, fine subangular blocky; friable consistence; few very fine roots; 10% coarse fragments
BCk	70–89	Dark olive gray (5Y 3/2); clay; weak, fine subangular blocky; friable consistence; few very fine roots; <10% coarse fragments
Ck	89–105+	Dark grayish brown (2.5Y 4/2); clay; weak, fine subangular blocky; friable consistence; weak effervescence

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 911, Solonetzic Gray Luvisol, mixed deciduous and coniferous (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	11–10	
F	10–1	
H	1–0	
Ae	0–3	Grayish brown (10YR 5/2); clay loam; weak, coarse platy; friable consistence; plentiful coarse roots
Btnj	3–33	Yellowish brown (10YR 5/4); clay/clay loam; strong, coarse subangular blocky; very firm consistence; plentiful coarse roots
Bt1	33–53	Olive gray (5Y 4/2); clay; moderate, medium subangular blocky; friable consistence; plentiful very fine roots; <10% coarse fragments; clay films present
Bt2	53–66	Dark olive gray (5Y 3/2); clay; strong, very fine subangular blocky; friable consistence; few fine roots; <10% coarse fragments; clay films present
BCk	66–87	Olive gray (5Y 4/2); clay; moderate, very fine subangular blocky; very friable consistence; few very fine roots; 20% coarse fragments
Ck	87–114+	Dark olive gray (5Y 3/2); clay; weak to moderate, very fine subangular blocky; very friable consistence; 10% coarse fragments

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 919, Solonetzic Gray Luvisol, coniferous dominant (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	12–10	
F	10–0	
Ahe	0–4	Dark grayish brown (10YR 4/2); clay
Ae	4–20	Light brownish gray (2.5Y 6/2); silty clay/silty clay loam; moderate, very coarse platy; plentiful fine roots
Btnj	20–36	Olive gray (5Y 5/2); clay; strong, medium subangular blocky; firm consistence; few fine roots; 5% coarse fragments
Bt1	36–52	Very dark grayish brown (2.5Y 3/2); clay/heavy clay; strong, fine subangular blocky; firm consistence; few very fine roots
Bt2	52–72	Dusky red (2.5YR 3/2); clay; moderate, fine subangular blocky; friable consistence; clay films present
BC	72–93	Dark olive gray (5Y 3/2); clay; moderate, coarse subangular blocky; friable consistence
C	93–110+	Very dark gray (10YR 3/1); clay; moderate, medium subangular blocky; friable consistence; few fine roots

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Res. ur. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 880, Podzolic Gray Luvisol, deciduous dominant with coniferous understory (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	4–3	
F	3–0	
Ah	0–2	No description available
Ahe	2–10	Brown (10YR 4/3); clay loam; weak, fine subangular blocky; friable consistence; plentiful coarse roots
Ae1	10–17	Yellowish brown (10YR 5/4); sandy clay loam; strong, medium subangular blocky; firm consistence; plentiful very fine roots; 40% coarse fragments
Bf	17–24	Yellowish brown (10YR 5/6); clay loam; strong, fine subangular blocky; firm consistence; few fine roots; 30% coarse fragments
Ae2	24–29	Yellowish brown (10YR 5/4); clay loam; weak, fine subangular blocky; very friable consistence; few fine roots
Bt	29–55	Dark yellowish brown (10YR 4/4); clay; strong, medium subangular blocky; firm consistence; few fine roots; 10% coarse fragments; clay films present
Bm	55–67	Yellowish brown (10YR 5/8); sandy clay loam; moderate, coarse subangular blocky; friable consistence; few very fine roots; 10% coarse fragments
BC	67–98	Dark yellowish brown (10YR 4/6); sandy clay loam; weak to moderate, coarse subangular blocky; firm consistence; few very fine roots; 10% coarse fragments
C	98–108+	Dark olive gray (5Y 3/2); sandy clay loam; weak, coarse subangular blocky; friable consistence

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B.C. Minist. Environ. and B.C. Minist. For., Victoria, BC.

Soil profile description for compartment 850, Orthic Melanic Brunisol, deciduous dominant (imperfectly drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	10–8	
F	8–2	
H	2–0	
Ah	0–12	Black (10YR 2/1); clay; weak, coarse platy; friable consistence; plentiful very fine roots
Bm1	12–17	Very dark grayish brown (10YR 3/2); clay; moderate, medium granular; friable consistence; plentiful medium roots
Ahb	17–27	Reddish black (2.5YR 2.5/1); clay; moderate, coarse subangular blocky; friable consistence; plentiful medium roots
Bm2	27–47	Olive brown (2.5Y 4/3); clay; moderate, fine granular; very friable consistence; plentiful fine roots; 10% coarse fragments
Bm3	47–70	Olive gray (5Y 4/2); clay; weak to moderate, fine subangular blocky; friable consistence; few fine roots; 10% coarse fragments
Bm4	70–85	Olive gray (5Y 4/2); clay; moderate, fine subangular blocky; firm consistence; few very fine roots; clay films present
BC	85–98	Dark olive gray (5Y 3/2); clay; strong, very fine subangular blocky; very friable consistence; few very fine roots; 10% coarse fragments
Ck	98–106+	Very dark grayish brown (2.5Y 3/2); clay; moderate, very fine subangular blocky; friable consistence

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52., Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B.C. Minist. Environ. and B.C. Minist. For., Victoria, BC

Soil profile description for compartment 892, Orthic Sombric Brunisol, coniferous dominant (imperfectly drained)

Horizon[a]	Depth (cm)	Soil description[b]
F	12–5	
H	5–0	
Ah	0–12	Black (5YR 2.5/1); clay; weak, fine subangular blocky; very friable consistence; plentiful coarse roots; <5% coarse fragments
AB	12–30	Very dark grayish brown (2.5Y 3/2); clay; strong, very fine subangular blocky; friable consistence; few very fine roots
Bm1	30–46	Dark olive gray (5Y 3/2); clay; strong, very fine subangular blocky; friable consistence; few very fine roots
Bm2	46–62	Dark olive gray (5Y 3/2); clay; weak to moderate, medium subangular blocky; friable consistence; <5% coarse fragments; clay films present
BC	62–98	Olive gray (5Y 4/2); clay; strong, very fine subangular blocky; friable consistence
C	98–109+	Dark olive gray (5Y 3/2); clay; strong, very fine subangular blocky; friable consistence; <5% coarse fragments

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 940, Eluviated Dystric Brunisol, deciduous dominant (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	12–10	
F	10–3	
H	3–0	
Ah	0–7	Black (5YR 2.5/1); heavy clay; weak, fine subangular blocky; friable consistence; plentiful very fine roots
Ahe	7–10	Very dark gray (2.5Y 3/1); heavy clay; weak, fine subangular blocky; friable consistence; plentiful very fine roots
Ae	10–13	Light brownish gray (2.5Y 6/2); heavy clay; moderate, fine subangular blocky; very firm consistence; plentiful very fine roots
Btj1	13–26	Olive gray (5Y 4/2); heavy clay; strong, fine angular blocky; firm consistence; plentiful very fine roots
Btj2	26–53	Very dark grayish brown (2.5Y 3/2); heavy clay; strong, coarse subangular blocky; very firm consistence; plentiful fine roots
BC	53–67	Very dark grayish brown (2.5Y 3/2); heavy clay; strong, coarse subangular blocky; firm consistence; few very fine roots
C	67–98+	Very dark grayish brown (2.5Y 3/2); heavy clay; strong, coarse subangular blocky; firm consistence; few fine roots; <10% coarse fragments

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52.; Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 896, Eluviated Dystric Brunisol, coniferous dominant (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	16–14	
F	14–0	
Ah	0–8	No description available
Aej	8–16	Light olive brown (2.5Y 5/4); clay/clay loam; strong, medium granular; firm consistence; plentiful fine roots
Bm1	16–38	Light olive brown (2.5Y 5/4); clay/clay loam; moderate, fine subangular blocky; friable consistence; plentiful very fine roots; 5% coarse fragments
Bm2	38–56	Light olive brown (2.5Y 5/4); clay loam; moderate, fine subangular blocky; friable consistence; plentiful medium roots
Bm3	56–63	Light olive brown (2.5Y 5/4); sandy clay loam/sandy loam; weak, fine subangular blocky; friable consistence
BC	63–78	Light olive brown (2.5Y 5/3); sandy clay; weak, coarse subangular blocky; friable consistence; few very fine roots; 40% coarse fragments
C	78–104+	Olive brown (2.5Y 4/3); clay; weak, fine subangular blocky; very friable consistence; few very fine roots; 5% coarse fragments

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52., Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 933, Orthic Luvic Gleysol, coniferous dominant (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	12–11	
F	11–2	
H	2–0	
Ahe	0–3	Dark grayish brown (10YR 4/2); clay; weak, fine subangular blocky; very friable consistence; plentiful medium roots; <5% coarse fragments
Aej	3–8	Light brownish gray (2.5Y 6/2); clay loam; weak, medium platy; very firm consistence; plentiful coarse roots; 5% coarse fragments
Btg1	8–34	Light olive gray (5Y 6/2); clay; strong, medium subangular blocky; firm consistence; few very fine roots
Btg2	34–52	Olive gray (5Y 4/2); clay; strong, very fine subangular blocky; friable consistence; few very fine roots; <5% coarse fragments; clay films present
Bt	52–79	Dark olive gray (5Y 3/2); heavy clay; moderate, fine subangular blocky; very friable consistence; few very fine roots; 5% coarse fragments; clay films present
Cca	79–109+	Black (5Y 2.5/2); clay; weak, fine subangular blocky; friable consistence; few fine roots; 5% coarse fragments; clay films present

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52., Luttmerding, H.A.; Demarchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

Soil profile description for compartment 859, Black Solodized Solonetz, deciduous dominant (well drained)

Horizon[a]	Depth (cm)	Soil description[b]
L	10–8	
F	8–2	
H	2–0	
Ah	0–3	Very dark grayish brown (10Y 3/2); clay; weak, coarse subangular blocky; very friable consistence; few fine roots
Ahe	3–4	Horizon not sampled
Ae	4–20	Light olive brown (2.5Y 5/3); silty clay loam; weak, coarse platy; friable consistence; plentiful fine roots
AB	20–25	Yellowish brown (10YR 5/4); clay; weak to moderate, fine subangular blocky; friable consistence; few fine roots
Bnt	25–39	Brown (10YR 4/3); clay; moderate, very fine prismatic; firm consistence; plentiful coarse roots
Bt	39–60	Dark grayish brown (2.5Y 4/2); clay-heavy clay; moderate, medium subangular blocky; friable consistence; few fine roots
BC	60–87	Very dark grayish brown (2.5Y 3/2); clay; strong, coarse subangular blocky; firm consistence; plentiful coarse roots
C	87–105+	Dark olive brown (2.5Y 3/3); clay; moderate, coarse subangular blocky; friable consistence; few fine roots

[a]Soil descriptions were not done for L, F, or H horizons. Soil description information is in the following order: field moist color; soil textural class; structure; consistence; roots; coarse fragments (where present); effervescence (where present). Soil textural class was determined from particle size analysis.

[b]Agriculture Canada Expert Committee on Soil Survey. 1983. The Canada soil information system: manual for describing soils in the field. J.H. Day, ed. Agric. Can., Res. Branch, Ottawa, ON. Land Resour. Res. Inst. Contrib. 82-52., Luttmerding, H.A.; Dematchi, D.A.; Lea, E.A.; Meidinger, D.V.; Vold, T., eds. 1990. Describing ecosystems in the field. 2nd ed. B. C. Minist. Environ. and B. C. Minist. For., Victoria, BC.

APPENDIX 5

Physical and Chemical Properties of Individual Soil Horizons, with Compartments Grouped by Soil Subgroup and Stand Types within Subgroups

Chemical and physical properties of soil horizons in compartment 952, Orthic Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.62	48.9	1.43	20.5	37.8	52.8	17.2	3.3	2.6	3.1	6.5	12.3	93.0	n.d.	n.a.	n.a.	n.a.	n.a.	0.08
F	5.87	46.3	1.92	132.3	51.7	67.5	16.7	3.6	2.6	30.7	29.3	188.4	104.8	n.d.	n.a.	n.a.	n.a.	n.a.	0.08
H	5.48	40.7	1.58	44.1	62.7	51.9	11.1	2.5	2.5	74.0	26.3	260.6	128.7	n.d.	n.a.	n.a.	n.a.	n.a.	0.08
Ae	4.64	0.8	0.07	9.5	18.8	2.2	0.9	0.2	0.5	30.2	0.9	30.3	10.8	35	n.a.	24	56	20	1.22
AB	4.55	0.7	0.08	4.1	19.8	2.7	1.7	0.2	0.5	33.1	0.5	54.4	12.2	41	n.a.	22	38	40	1.56
Bt1	4.23	0.7	0.07	5.7	28.2	6.4	5.5	0.3	0.7	72.9	0.6	178.0	31.8	41	n.a.	18	26	56	1.31
Bt2	4.47	0.7	0.06	5.9	67.4	7.5	6.4	0.3	0.8	62.1	0.8	85.1	31.7	47	n.a.	16	26	58	1.43
Bt3	5.89	0.8	0.06	3.7	69.4	8.4	6.6	0.2	0.9	23.8	0.6	19.4	27.6	59	n.a.	16	36	48	1.31
BCca	6.70	1.1	0.07	4.0	72.1	13.4	6.6	0.3	0.9	18.7	0.7	20.7	25.1	84	4	16	28	56	1.45
Ck	6.84	1.1	0.07	4.6	157.6	14.2	5.4	0.2	0.8	18.9	1.0	17.9	22.7	91	5	16	32	52	1.21

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a.= not applicable.

Chemical and physical properties of soil horizons in compartment 907, Orthic Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.04	49.1	0.76	105.6	120.2	34.9	11.9	3.3	2.4	3.1	3.1	3.4	118.3	n.d	n.a.	n.a.	n.a.	n.a.	0.07
F	5.73	45.0	1.33	111.4	21.7	69.5	12.9	2.7	2.6	83.6	31.8	212.8	137.6	n.d	n.a.	n.a.	n.a.	n.a.	0.07
H	5.60	20.1	0.92	39.7	17.6	42.5	6.7	2.0	2.2	2.3	7.5	12.1	83.1	n.d	n.a.	n.a.	n.a.	n.a.	0.07
Ah	5.58	4.9	0.36	85.3	23.8	11.9	2.3	1.5	0.6	73.1	19.6	170.2	32.7	50	n.a.	30	26	44	0.66
Ahe	5.52	1.0	0.09	25.0	19.9	2.6	0.6	0.2	0.4	30.0	3.4	38.1	11.3	34	n.a.	30	28	42	1.45
Ae	5.46	0.4	0.02	11.9	20.6	1.6	0.4	0.1	0.4	18.2	0.8	24.5	11.8	22	n.a.	54	24	22	1.48
Bm	5.36	0.5	0.05	8.0	23.0	7.3	2.8	0.3	0.6	39.0	0.7	62.4	22.1	50	n.a.	48	32	20	1.43
Bt	5.42	0.6	0.04	8.6	21.2	7.7	2.9	0.2	0.5	52.8	0.8	57.9	22.3	51	n.a.	30	28	42	1.49
BC	5.57	0.6	0.04	10.1	23.1	7.3	2.5	0.2	0.5	30.7	0.8	23.3	27.5	38	n.a.	28	30	42	1.59
Cca	6.24	0.5	0.03	9.4	21.7	8.4	3.0	0.2	0.5	19.5	0.8	20.0	18.8	65	4	34	28	38	1.29

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 946, Orthic Gray Luvisol

		Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC	Base saturation	$CaCO_3$	Particle size (%)			Bulk density[b]
Horizon	pH	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al	(cmol(+)/kg)	(%)	(%)	Sand	Silt	Clay	(g/cm^3)
L	5.16	47.6	0.99	78.7	63.5	30.2	6.3	2.1	4.1	4.9	8.2	42.2	121.4	n.d	n.a.	n.a.	n.a.	n.a.	0.07
F	5.62	44.7	1.95	85.7	44.0	59.6	11.2	2.6	4.4	70.9	28.9	143.1	118.1	n.d	n.a.	n.a.	n.a.	n.a.	0.07
Ah	5.30	7.7	0.52	40.6	25.6	13.5	3.5	0.9	2.0	39.2	9.0	65.6	49.7	40	n.a.	20	38	42	n.d.
Ahe	5.08	1.7	0.13	12.9	21.1	4.6	1.6	0.4	0.5	53.6	5.9	77.0	29.1	25	n.a.	20	60	20	n.d.
Ae	4.90	0.5	0.05	6.2	23.7	1.3	0.5	0.1	0.4	39.2	1.0	45.7	11.4	20	n.a.	12	62	26	1.43
AB	4.67	0.5	0.06	5.5	20.5	3.1	1.7	0.2	0.3	43.6	0.6	72.7	23.1	22	n.a.	10	46	44	1.56
Bt1	4.51	0.7	0.07	4.2	21.8	9.6	5.5	0.5	2.4	96.5	0.7	218.2	45.9	39	n.a.	4	22	74	1.09
Bt2	4.70	0.8	0.06	4.1	28.5	9.9	5.2	0.3	0.4	76.7	0.9	124.6	39.9	40	n.a.	10	22	68	1.37
BCk	5.56	0.9	0.06	5.2	27.4	10.7	4.9	0.2	0.5	47.5	1.0	28.6	32.6	50	2	12	26	62	1.25
Ck	6.56	2.0	0.06	3.8	36.8	16.5	3.2	0.2	0.6	14.6	1.1	12.3	25.1	82	8	12	30	58	1.42

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a.= not applicable.

Chemical and physical properties of soil horizons in compartment 867, Orthic Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.58	47.9	1.26	127.6	26.5	41.0	7.5	3.6	4.4	5.7	7.3	21.4	114.3	n.d.	n.a.	n.a.	n.a.	n.a.	0.09
F	5.65	40.8	1.54	92.0	26.4	61.0	7.3	2.5	4.5	36.1	10.3	128.2	142.8	n.d.	n.a.	n.a.	n.a.	n.a.	0.09
H	4.92	31.2	1.31	111.7	39.9	48.4	6.6	1.7	4.3	3.3	3.6	4.1	131.6	n.d.	n.a.	n.a.	n.a.	n.a.	0.09
Ae	5.27	2.5	0.19	6.7	37.5	10.9	2.5	0.6	0.6	74.8	1.8	196.7	39.2	37	n.a.	10	36	54	1.09
Bt1	5.59	1.5	0.14	3.8	32.5	13.7	3.2	0.4	1.2	89.5	0.7	240.9	39.0	47	n.a.	6	32	62	1.29
Bt2	6.02	1.2	0.10	3.4	38.0	14.0	3.4	0.3	0.5	86.0	0.5	180.6	40.4	45	n.a.	6	32	62	1.09
Btj	6.32	1.0	0.10	5.3	64.9	14.1	3.3	0.3	0.3	66.8	0.6	162.4	38.5	47	n.a.	12	28	60	1.19
BC	6.50	0.7	0.09	3.9	48.3	12.0	2.9	0.3	0.3	55.1	0.6	137.8	29.4	53	n.a.	6	36	58	1.17
Ck	6.73	0.8	0.10	4.1	49.6	15.4	3.7	0.3	0.4	57.4	0.7	120.1	40.2	49	4	6	34	60	1.19

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 928, Orthic Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	4.78	51.6	1.03	104.4	134.8	22.4	5.8	3.1	2.3	2.5	10.1	0.0	89.5	n.d.	n.a.	n.a.	n.a.	n.a.	0.04
F	5.59	49.9	1.52	172.6	46.2	54.5	8.2	2.7	2.3	1.2	7.3	1.3	72.7	n.d.	n.a.	n.a.	n.a.	n.a.	0.04
H	4.19	37.2	1.10	188.6	39.3	40.7	7.0	0.7	2.2	75.6	7.0	224.9	83.4	n.d.	n.a.	n.a.	n.a.	n.a.	0.04
Ahe	Horizon not sampled																		
Ae	4.54	1.4	0.10	4.9	32.0	5.2	1.9	0.2	0.6	51.7	1.2	57.9	14.1	56	n.a.	18	44	38	1.59
Bt1	5.77	0.9	0.07	3.5	196.2	13.3	6.8	0.3	0.9	44.1	0.7	23.0	30.6	70	n.a.	10	26	64	1.38
Bt2	6.34	0.7	0.06	3.6	253.7	12.5	6.4	0.2	0.9	27.2	1.0	9.8	26.7	75	n.a.	16	28	56	1.24
BCk1	6.88	1.3	0.05	2.1	202.2	21.4	4.9	0.2	1.0	10.8	0.6	1.1	17.5	n.d.	5	26	30	44	1.35
BCk2	6.99	1.2	0.07	2.4	402.3	55.2	6.5	0.4	1.3	7.5	0.5	0.0	19.9	n.d.	5	14	30	56	1.05

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 904, Orthic Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	4.91	51.1	1.04	128.8	128.5	28.6	7.3	3.1	2.2	1.3	4.4	1.0	72.9	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
F	4.52	48.1	1.47	81.8	75.9	61.8	5.7	2.4	2.4	1.9	9.3	5.8	114.6	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
H	4.26	33.9	1.00	118.1	33.9	36.7	3.7	1.1	2.2	18.1	41.2	52.9	63.3	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
Ahe	4.49	2.9	0.16	80.0	22.0	7.2	1.7	0.3	0.6	47.7	25.1	84.3	24.5	40	n.a.	24	36	40	n.d.
Ae	4.63	0.5	0.05	12.6	20.7	2.9	0.9	0.1	0.5	22.2	4.2	24.6	9.2	49	n.a.	22	44	34	1.32
AB	4.84	0.5	0.06	3.7	21.8	6.1	2.3	0.2	0.6	25.4	2.0	72.2	18.6	50	n.a.	24	30	46	1.50
Bt1	4.43	0.5	0.05	4.4	20.3	9.1	4.2	0.4	0.7	59.0	0.6	177.1	23.1	62	n.a.	17	23	60	1.43
Bt2	4.30	0.5	0.05	5.3	21.1	7.8	3.8	0.3	0.7	72.4	0.6	125.9	26.7	47	n.a.	18	28	54	1.36
BC	4.93	0.9	0.06	4.7	27.7	9.4	4.3	0.2	0.7	67.7	1.0	172.4	29.0	51	n.a.	20	24	56	1.44
C	6.21	1.0	0.06	3.5	35.7	11.7	5.7	0.2	0.7	27.9	1.4	24.5	25.2	73	n.a.	18	28	54	1.33

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 875, Orthic Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
F	4.53	48.5	1.18	93.0	82.0	45.2	5.5	2.2	2.3	147.1	15.4	284.9	89.5	n.d.	n.a.	n.a.	n.a.	n.a.	0.07
Ah	4.33	11.2	0.60	99.7	23.5	22.5	4.1	0.7	2.2	1.8	3.1	1.6	61.9	48	n.a.	n.a.	n.a.	n.a.	0.66
Aej	4.81	2.3	0.13	12.8	24.4	5.4	1.1	0.3	0.3	54.9	1.3	65.6	18.6	38	n.a.	30	18	52	n.d.
Ae	4.87	0.7	0.05	8.1	22.7	9.6	3.4	0.2	1.0	55.3	0.9	104.8	15.0	95	n.a.	32	34	34	1.48
Btj	5.22	0.8	0.06	9.5	25.3	10.8	3.7	0.3	0.4	109.6	0.9	408.6	36.9	41	n.a.	14	48	38	1.18
Bt	5.98	0.8	0.05	4.9	23.2	13.2	4.0	0.3	0.5	78.4	0.8	210.1	32.5	55	n.a.	18	24	58	1.40
BC	6.28	0.8	0.07	3.8	27.8	10.8	3.0	0.3	0.4	36.3	0.9	57.7	33.2	43	n.a.	20	28	52	1.55
Cca	6.49	1.0	0.06	2.4	31.8	14.2	3.0	0.3	0.4	32.0	0.8	82.1	28.1	64	4	18	32	50	1.35

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 925, Orthic Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	4.91	50.8	1.02	142.6	128.7	27.6	5.8	2.9	3.9	1.6	11.8	2.9	133.5	n.d.	n.a.	n.a.	n.a.	n.a.	0.05
F	5.08	48.1	1.60	125.1	95.6	47.8	5.7	2.9	4.2	4.9	10.9	30.8	168.9	n.d.	n.a.	n.a.	n.a.	n.a.	0.05
H	4.28	46.8	1.53	119.8	78.0	38.5	3.9	1.8	4.0	2.0	2.4	1.0	105.3	n.d.	n.a.	n.a.	n.a.	n.a.	0.05
Ahe	Horizon not sampled																		
Ae	4.44	1.1	0.08	6.4	24.7	2.2	0.9	0.1	0.3	43.1	2.4	72.5	29.2	12	n.a.	22	42	36	1.58
Bt1	4.18	0.7	0.07	4.5	21.3	5.5	4.5	0.3	1.3	91.0	0.6	300.4	37.0	31	n.a.	10	34	56	1.28
Bt2	4.36	0.6	0.06	5.2	52.3	8.5	7.2	0.3	0.5	78.1	0.6	113.9	44.6	37	n.a.	16	28	56	1.45
Bt3	6.14	0.8	0.07	4.3	158.3	10.6	7.2	0.3	0.9	32.3	1.1	25.5	43.2	44	n.a.	20	26	54	1.16
BCk	6.92	1.2	0.06	4.1	226.5	22.2	7.1	0.3	1.7	31.8	0.8	75.1	30.0	n.d.	5	18	32	50	1.35

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 856, Dark Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	6.41	47.1	1.82	108.8	15.3	75.1	12.0	4.2	2.8	6.1	2.4	4.9	113.3	n.d.	n.a.	n.a.	n.a.	n.a.	0.10
F	6.07	41.8	2.00	106.2	27.7	80.6	11.1	2.8	2.6	117.4	9.3	176.1	122.8	n.d.	n.a.	n.a.	n.a.	n.a.	0.10
H	6.54	17.5	1.42	60.9	15.6	71.6	3.0	0.4	2.5	1.5	3.8	0.7	86.9	n.d.	n.a.	n.a.	n.a.	n.a.	0.10
Ae	Horizon not sampled																		
Ah	6.56	7.8	0.60	6.3	23.2	24.4	1.5	0.3	0.3	70.1	2.1	102.3	55.0	48	n.a.	22	38	40	n.d.
Aej	5.94	0.9	0.07	5.9	18.9	10.4	1.5	0.2	0.3	67.2	1.0	154.3	27.9	45	n.a.	18	38	44	n.d.
Bm	6.06	0.5	0.04	5.6	23.6	7.4	1.4	0.2	1.0	44.9	0.7	60.3	22.8	43	n.a.	24	38	38	1.29
Bt1	6.23	0.8	0.05	5.1	21.4	9.3	2.2	0.2	0.3	59.0	0.8	106.2	26.9	44	n.a.	16	30	54	1.39
Bt2	6.36	0.7	0.05	4.9	22.4	9.4	2.5	0.2	0.3	34.4	0.7	25.1	25.2	49	n.a.	18	26	56	1.41
BCk	6.49	0.7	0.05	6.6	24.3	13.1	3.4	0.3	0.3	27.8	1.1	10.3	26.8	64	4	18	26	56	1.41

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 888, Dark Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.34	50.9	1.07	106.1	181.0	31.4	9.3	5.1	2.3	1.3	4.0	0.9	77.5	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
F	5.25	46.8	1.60	115.8	73.7	61.8	9.2	3.3	2.4	2.3	7.7	20.3	126.5	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
H	4.90	31.2	1.26	131.3	56.1	37.8	4.9	1.3	2.2	37.7	42.8	178.3	79.5	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
Ahe	4.52	3.2	0.25	21.0	30.5	6.2	1.2	0.5	0.6	57.3	16.2	102.3	22.4	38	n.a.	18	46	36	0.78
Ae	4.39	0.8	0.08	6.0	20.1	2.6	0.7	0.2	0.6	35.4	2.4	48.2	7.5	54	n.a.	12	58	30	1.31
Bt1	4.46	0.7	0.07	4.0	21.8	7.1	2.6	0.3	0.7	50.5	0.7	104.5	24.5	43	n.a.	20	26	54	1.05
Bt2	4.33	0.8	0.06	3.9	19.7	9.8	3.5	0.4	0.7	54.9	0.5	159.2	28.3	51	n.a.	16	20	64	1.11
BC	4.74	0.8	0.37	6.5	20.5	10.1	3.2	0.2	0.6	68.6	1.0	132.6	25.8	55	n.a.	22	22	56	1.24
Ck	6.63	1.2	0.05	1.6	20.9	22.0	3.6	0.3	0.8	16.6	0.7	24.7	25.4	n.d.	4	22	28	50	1.15

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 961, Dark Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	4.90	50.9	0.82	128.8	39.9	20.0	6.8	1.9	1.7	1.7	7.3	1.7	102.5	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
F	5.30	47.6	1.19	27.5	44.3	53.7	9.7	2.5	2.5	1.2	4.5	0.3	117.0	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
H	Horizon not sampled																		
Ahe	4.65	4.5	0.22	7.9	27.3	6.6	2.0	0.5	0.5	40.7	2.3	53.0	32.6	29	n.a.	22	34	44	0.64
Aej	4.53	1.8	0.12	5.7	24.1	4.6	1.5	0.3	0.5	39.4	1.0	63.9	22.5	31	n.a.	20	38	42	0.78
Bt1	4.57	0.9	0.08	4.0	36.0	9.3	3.3	0.4	0.6	29.4	1.4	12.1	26.1	53	n.a.	18	26	56	1.11
Bt2	6.04	0.8	0.06	3.7	400.3	13.9	5.0	0.2	0.9	15.9	0.8	5.1	30.4	66	n.a.	16	28	56	1.11
BCk	6.84	1.3	0.06	2.4	209.8	20.2	5.3	0.2	0.9	14.1	0.6	2.7	22.6	n.d.	4	18	30	52	1.30
Ck	6.97	1.3	0.06	2.0	459.7	56.3	5.8	0.3	1.0	7.8	0.6	11.6	20.6	n.d.	6	22	30	48	1.43

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 954, Dark Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.02	48.7	0.90	115.8	141.7	28.8	11.5	3.8	2.6	1.8	6.4	0.0	94.1	n.d.	n.a.	n.a.	n.a.	n.a.	0.10
F	5.33	46.2	1.57	137.2	50.7	59.6	13.0	3.4	2.8	3.3	6.6	7.4	101.4	n.d.	n.a.	n.a.	n.a.	n.a.	0.10
Ah	4.67	6.7	0.45	24.6	22.1	10.7	2.7	1.0	0.7	92.9	27.2	102.4	37.3	41	n.a.	40	22	38	0.58
Ahe	4.61	1.5	0.13	12.8	22.1	3.2	1.0	0.3	0.5	69.8	3.7	55.6	9.0	56	n.a.	52	24	24	1.17
Ae	4.66	0.3	0.03	6.6	21.7	1.0	0.4	0.1	0.5	23.2	0.6	17.6	3.0	65	n.a.	50	30	20	1.32
Bt1	4.41	0.7	0.08	3.8	25.2	7.8	4.4	0.4	0.6	66.0	0.7	95.0	26.9	49	n.a.	8	24	68	1.50
Bt2	4.26	0.5	0.06	4.5	20.5	7.4	4.2	0.3	0.7	92.0	0.7	151.7	25.1	50	n.a.	22	18	60	1.41
Bt3	4.31	0.7	0.06	4.8	20.7	7.3	4.0	0.3	0.7	70.7	0.6	160.5	24.3	50	n.a.	16	26	58	1.44
BC	4.71	0.8	0.06	6.7	31.3	7.6	3.8	0.2	0.7	49.4	0.6	40.9	20.3	61	n.a.	30	22	48	1.36

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 900, Dark Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.75	48.5	1.76	69.4	96.5	51.8	18.2	4.1	2.4	1.7	4.3	2.6	101.0	n.d.	n.a.	n.a.	n.a.	n.a.	0.10
F	5.94	45.5	2.12	50.0	68.4	69.8	17.2	2.3	2.6	2.4	9.0	2.5	107.9	n.d.	n.a.	n.a.	n.a.	n.a.	0.10
Ahe	Horizon not sampled																		
Ae	5.83	1.1	0.08	8.6	22.2	2.5	0.5	0.1	0.5	30.4	3.5	37.0	7.0	51	n.a.	16	46	38	n.d.
Bt1	4.67	0.9	0.09	3.0	21.5	7.1	2.6	0.3	0.6	62.3	0.7	105.7	23.7	45	n.a.	8	32	60	1.17
Bt2	4.14	0.7	0.07	3.0	25.6	6.3	3.1	0.3	0.6	78.2	0.6	213.3	23.1	45	n.a.	8	28	64	1.38
BC	4.02	0.9	0.10	3.4	48.6	6.8	3.7	0.3	0.7	66.8	0.5	126.9	28.0	41	n.a.	4	28	68	1.16
C	4.11	0.8	0.07	5.6	23.0	6.6	3.7	0.3	0.7	83.2	0.7	236.6	26.0	43	n.a.	12	28	60	n.d.

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.
[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a.= not applicable.

Chemical and physical properties of soil horizons in compartment 908, Dark Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.79	49.5	1.95	89.3	68.5	46.9	20.0	3.7	2.6	4.6	7.2	7.0	126.9	n.d.	n.a.	n.a.	n.a.	n.a.	0.11
F	5.89	41.3	1.85	74.3	55.3	54.5	16.9	2.5	2.6	5.2	8.9	4.9	156.6	n.d.	n.a.	n.a.	n.a.	n.a.	0.11
Ahe	4.55	3.3	0.26	5.5	22.7	4.8	1.6	0.6	0.5	42.8	4.5	59.7	22.0	34	n.a.	10	40	50	0.88
Ae	4.20	1.0	0.13	4.5	20.4	2.1	0.9	0.3	0.4	46.6	1.4	97.4	13.1	27	n.a.	10	40	50	n.d.
Bt1	3.89	1.1	0.14	4.5	19.7	3.2	1.7	0.3	0.6	62.9	0.5	136.5	19.2	30	n.a.	0	32	68	1.20
Bt2	3.84	0.7	0.08	4.1	26.7	4.3	2.7	0.3	0.7	54.7	0.7	219.4	31.3	26	n.a.	16	26	58	1.28
BC	3.83	0.7	0.08	8.3	19.2	3.9	2.5	0.2	0.6	55.6	0.9	206.4	23.1	31	n.a.	16	28	56	1.04
C	3.94	0.8	0.09	6.9	23.2	3.8	2.4	0.2	0.6	42.2	1.3	160.7	29.0	24	n.a.	14	28	58	n.d.

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 937, Dark Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
F	4.55	43.5	1.34	70.4	56.1	39.2	9.3	1.4	2.2	193.2	76.4	285.1	106.1	n.d.	n.a.	n.a.	n.a.	n.a.	0.62
H	4.46	20.3	0.98	86.7	31.4	25.8	7.3	0.8	2.3	1.9	5.7	1.1	78.4	n.d.	n.a.	n.a.	n.a.	n.a.	0.62
Ah	4.87	6.0	0.50	15.2	39.6	7.7	2.6	0.7	0.5	138.7	6.7	148.3	37.9	30	n.a.	20	30	50	0.66
Ae	4.77	1.3	0.13	6.8	25.0	3.8	1.8	0.2	0.5	74.0	2.1	94.5	14.6	43	n.a.	26	30	44	1.48
Bt1	4.92	0.9	0.10	4.7	26.0	6.0	3.1	0.3	0.5	61.3	0.8	72.8	29.0	34	n.a.	18	24	58	1.50
Bt2	5.07	0.8	0.07	3.7	22.3	6.5	3.0	0.3	0.5	48.9	0.5	94.0	28.4	36	n.a.	20	22	58	1.34
Bt3	5.53	0.8	0.07	4.0	22.9	11.2	4.9	0.3	0.7	44.3	0.5	32.0	32.4	53	n.a.	10	24	66	1.41
Bt4	5.98	0.7	0.06	4.3	26.1	10.6	3.9	0.3	0.6	28.2	0.7	46.6	29.0	53	n.a.	14	28	58	1.31
Ck	6.69	1.0	0.07	3.6	37.8	14.4	3.4	0.3	0.6	11.2	0.7	20.4	27.8	67	4	10	38	52	1.50

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 923, Dark Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	4.41	52.0	0.66	83.8	82.3	27.0	6.2	2.1	2.2	3.7	8.1	56.2	62.6	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
F	4.42	52.4	1.19	48.2	317.1	46.3	7.7	2.0	2.4	139.5	29.9	362.2	118.3	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
H	4.66	23.5	0.92	63.4	530.5	57.3	10.7	0.6	2.5	1.8	4.8	1.7	118.3	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
Ahe	6.17	2.2	0.14	9.2	264.1	13.5	4.3	0.4	0.5	53.0	1.8	121.2	35.1	53	n.a.	20	30	50	1.00
Ae	6.36	0.5	0.05	3.8	114.4	4.8	1.8	0.2	0.4	29.6	0.8	24.3	19.9	36	n.a.	14	48	38	1.30
Bt1	6.42	0.5	0.06	2.3	161.2	10.9	4.8	0.3	0.5	47.2	0.7	25.0	32.5	51	n.a.	14	28	58	1.42
Bt2	6.51	0.6	0.05	3.1	120.9	11.2	4.8	0.3	0.5	56.4	0.7	133.3	31.8	53	n.a.	20	26	54	1.40
Bt3	6.59	0.6	0.04	2.3	97.5	11.3	4.5	0.2	0.5	22.2	0.6	19.4	31.6	52	n.a.	18	28	54	1.34
BCk	6.66	0.6	0.05	3.4	107.4	11.5	4.5	0.2	0.5	26.9	0.6	32.3	30.9	54	5	20	28	52	1.58
Ck	6.79	1.0	0.05	2.7	109.7	15.9	4.7	0.3	0.5	19.4	0.7	42.6	33.4	64	1	20	28	52	1.51

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 911, Solonetzic Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	4.93	50.0	0.64	80.5	73.5	31.5	12.6	2.5	2.3	2.8	9.7	6.9	86.3	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
F	4.95	44.5	1.03	48.1	91.4	45.2	8.0	2.2	2.3	8.0	2.6	29.9	131.9	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
H	4.03	39.6	0.81	62.7	61.6	32.8	7.8	1.6	2.3	1.5	3.7	1.0	125.9	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
Ae	3.59	2.1	0.09	28.2	29.8	1.8	1.5	0.3	0.4	55.4	1.1	51.5	17.3	23	n.a.	32	36	32	1.27
Btnj	4.31	0.5	0.04	9.1	38.3	3.3	2.4	0.2	0.6	44.4	0.7	100.8	22.7	28	n.a.	28	32	40	1.23
Bt1	5.10	0.6	0.05	7.0	210.2	10.1	6.8	0.3	0.6	72.2	1.1	180.4	36.8	48	n.a.	20	28	52	1.52
Bt2	5.83	0.8	0.05	6.8	296.4	9.7	5.7	0.2	0.6	21.6	1.2	13.0	29.2	55	n.a.	16	30	54	1.65
BCk	6.65	1.3	0.05	8.1	220.3	18.5	5.7	0.3	0.7	19.1	1.3	7.5	26.3	96	5	14	34	52	1.62
Ck	6.74	1.4	0.05	6.3	203.3	20.0	5.8	0.3	0.7	13.7	0.6	8.7	20.9	n.d.	5	18	32	50	1.73

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a.= not applicable.

Chemical and physical properties of soil horizons in compartment 919, Solonetzic Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.03	50.1	0.98	88.6	188.4	30.1	8.1	3.4	2.4	4.8	13.4	28.0	97.3	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
F	4.47	40.8	1.25	170.7	61.7	46.1	5.5	1.9	2.4	1.3	4.0	0.0	90.2	n.d.	n.a.	n.a.	n.a.	n.a.	0.06
Ahe	4.75	3.2	0.20	23.4	21.9	5.9	1.5	0.5	0.5	48.3	13.4	63.9	24.7	34	n.a.	17	40	43	n.d.
Ae	4.65	0.6	0.07	5.0	20.2	2.2	0.9	0.2	0.4	34.2	0.7	60.9	11.4	33	n.a.	10	50	40	1.16
Btnj	4.05	0.5	0.07	4.5	18.3	5.4	2.5	0.3	0.6	41.2	0.5	102.8	23.2	38	n.a.	18	28	54	1.25
Bt1	4.09	0.5	0.10	5.5	18.0	6.8	3.0	0.3	0.6	58.2	0.6	109.2	27.6	39	n.a.	14	26	60	1.38
Bt2	4.22	0.6	0.10	7.8	18.2	8.4	3.6	0.3	0.6	49.7	0.6	114.0	24.3	53	n.a.	14	28	58	1.35
BC	4.63	0.9	0.07	8.8	19.5	9.0	3.5	0.3	0.6	38.5	0.6	40.2	28.0	48	n.a.	14	28	58	1.24
C	5.29	0.9	0.08	6.0	19.7	10.7	3.8	0.2	0.6	28.7	0.5	35.5	31.3	49	n.a.	10	34	56	1.15

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 880, Podzolic Gray Luvisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.46	50.0	1.26	2.9	83.0	35.1	12.0	3.1	2.5	5.3	9.0	10.1	94.4	n.d.	n.a.	n.a.	n.a.	n.a.	0.09
F	5.91	36.9	1.50	65.5	17.9	52.0	11.1	2.2	2.5	32.6	31.9	64.5	105.0	n.d.	n.a.	n.a.	n.a.	n.a.	0.09
Ah	5.82	16.1	0.30	56.5	19.5	32.6	5.3	1.3	2.3	1.5	2.8	1.7	63.6	65	n.a.	n.a.	n.a.	n.a.	0.87
Ahe	5.60	1.9	0.15	14.3	24.7	4.3	1.1	0.3	0.3	41.1	17.2	43.9	22.0	27	n.a.	30	38	32	n.d.
Ae1	4.44	0.4	0.05	9.5	24.5	2.2	0.9	0.1	0.3	26.7	3.1	35.9	13.9	26	n.a.	48	26	26	n.d.
Bf	5.03	0.5	0.05	7.9	19.8	2.8	1.1	0.1	0.5	27.6	2.5	81.2	15.2	30	n.a.	32	34	34	1.34
Ae2	4.94	0.6	0.06	8.3	19.7	2.6	1.4	0.1	0.3	29.7	1.6	81.9	14.8	30	n.a.	44	22	34	n.d.
Bt	4.23	0.6	0.07	7.7	19.3	5.0	3.0	0.2	0.2	37.9	0.9	103.9	27.5	31	n.a.	22	26	52	1.43
Bm	4.24	0.4	0.04	9.8	21.7	2.8	1.6	0.1	0.2	76.2	0.8	314.8	20.0	24	n.a.	56	14	30	1.58
BC	4.33	0.4	0.03	15.4	23.8	4.7	2.5	0.2	0.6	102.2	19.6	165.8	21.5	37	n.a.	56	12	32	1.50
C	4.44	3.8	0.04	16.8	22.1	4.3	2.2	0.2	1.5	61.4	0.7	153.9	15.0	54	n.a.	52	18	30	1.51

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a.= not applicable.

Chemical and physical properties of soil horizons in compartment 850, Orthic Melanic Brunisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.49	47.8	1.36	141.1	57.9	46.4	12.3	2.8	4.3	2.4	2.0	0.0	146.7	n.d.	n.a.	n.a.	n.a.	n.a.	0.09
F	6.00	47.1	1.99	72.8	22.3	98.8	15.3	2.5	4.9	82.0	13.2	157.5	158.2	n.d.	n.a.	n.a.	n.a.	n.a.	0.09
H	6.03	22.2	1.33	71.9	25.0	61.6	7.4	1.0	2.5	1.9	1.0	1.3	107.1	n.d.	n.a.	n.a.	n.a.	n.a.	0.09
Ah	5.96	5.4	0.49	11.0	20.1	23.2	3.7	0.5	0.9	55.6	5.3	53.4	50.6	56	n.a.	10	36	55	1.09
Bm1	5.92	2.1	0.13	5.6	20.1	8.7	1.6	0.2	0.2	47.8	1.7	74.3	28.6	38	n.a.	20	36	44	n.d.
Ahb	5.85	5.2	0.36	5.8	19.4	19.0	3.3	0.3	0.8	72.5	2.5	100.7	48.7	48	n.a.	14	34	52	0.90
Bm2	5.94	0.8	0.05	4.9	21.6	7.7	2.0	0.2	0.4	52.8	1.4	45.5	24.8	42	n.a.	16	40	44	1.25
Bm3	6.08	0.9	0.06	5.5	19.7	8.7	2.7	0.2	0.7	49.5	0.9	85.7	30.0	41	n.a.	16	32	52	1.30
Bm4	6.31	0.8	0.06	7.2	20.7	9.7	3.3	0.3	0.7	55.5	1.0	88.3	30.9	45	n.a.	14	32	54	1.60
BC	6.42	0.8	0.06	5.8	26.0	11.8	5.0	0.3	0.5	39.0	1.1	43.1	25.3	69	n.a.	16	28	56	1.52
Ck	6.56	0.8	0.07	7.6	26.3	11.7	4.3	0.3	0.5	33.9	1.3	87.7	27.9	60	4	18	28	54	1.50

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 892, Orthic Sombric Brunisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
F	4.74	43.4	1.54	58.6	41.0	60.0	11.2	1.8	2.4	26.0	2.7	104.6	138.7	n.d.	n.a.	n.a.	n.a.	n.a.	0.08
H	4.33	42.7	1.50	76.3	39.1	66.3	13.7	1.1	2.6	9.7	7.2	132.0	137.3	n.d.	n.a.	n.a.	n.a.	n.a.	0.08
Ah	5.37	6.1	0.55	9.2	24.2	17.9	5.0	0.4	0.5	107.5	4.9	104.7	54.1	44	n.a.	18	38	44	0.87
AB	5.49	1.1	0.10	6.6	24.8	11.2	4.2	0.3	0.5	50.9	0.7	50.0	31.4	52	n.a.	14	32	54	1.46
Bm1	5.75	0.9	0.06	6.6	28.1	10.9	3.9	0.3	0.4	51.0	0.7	47.0	32.3	48	n.a.	16	28	56	1.50
Bm2	5.90	0.8	0.06	7.4	24.8	9.1	3.1	0.2	0.4	39.0	0.6	43.9	27.3	47	n.a.	16	32	52	1.50
BC	6.05	0.7	0.06	7.7	22.9	9.1	3.1	0.2	0.4	30.6	1.2	30.6	33.0	39	n.a.	16	32	52	1.46
C	6.12	0.7	0.06	8.7	24.0	9.3	3.1	0.2	0.4	39.9	0.7	57.6	31.1	42	n.a.	16	32	52	1.61

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.
[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 940, Eluviated Dystric Brunisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.85	48.8	0.70	73.9	22.4	53.1	13.5	3.2	2.6	10.2	6.7	48.1	96.2	n.d.	n.a.	n.a.	n.a.	n.a.	0.07
F	5.95	42.3	0.92	91.6	25.4	52.9	10.8	2.3	2.4	41.0	15.8	155.7	109.7	n.d.	n.a.	n.a.	n.a.	n.a.	0.07
H	5.43	25.0	0.86	97.3	40.1	45.0	7.6	1.7	2.4	1.5	5.5	0.6	134.7	n.d.	n.a.	n.a.	n.a.	n.a.	0.07
Ah	4.72	8.1	0.57	34.4	23.0	15.9	3.6	1.0	0.6	58.9	1.0	153.0	51.0	41	n.a.	16	20	64	n.d.
Ahe	4.80	5.1	0.41	24.8	29.1	15.7	3.9	0.9	0.6	97.1	16.3	202.2	42.3	50	n.a.	16	20	64	n.d.
Ae	4.88	2.4	0.23	11.1	26.3	8.8	2.6	0.5	0.5	109.0	2.6	227.5	30.7	41	n.a.	10	26	64	0.82
Btj1	4.81	0.5	0.13	9.2	31.5	7.9	2.8	0.4	0.5	95.8	0.7	135.0	26.0	45	n.a.	8	22	70	1.38
Btj2	4.39	1.0	0.10	8.0	32.8	10.5	4.1	0.5	0.6	126.3	0.8	308.6	34.4	46	n.a.	8	22	70	1.25
BC	4.24	0.8	0.08	13.3	35.9	9.5	3.7	0.3	0.6	95.5	0.9	169.8	32.4	44	n.a.	18	20	62	1.32
C	4.21	1.0	0.08	13.4	33.4	9.7	3.6	0.3	0.6	96.0	1.0	225.6	35.7	40	n.a.	6	22	72	1.34

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a.= not applicable.

Chemical and physical properties of soil horizons in compartment 896, Eluviated Dystric Brunisol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.80	49.6	1.61	24.7	26.9	52.6	12.3	4.0	2.5	1.4	5.3	0.8	113.1	n.d.	n.a.	n.a.	n.a.	n.a.	0.09
F	5.61	47.5	2.00	79.2	121.4	78.0	14.2	3.5	2.7	71.8	42.4	72.7	129.3	n.d.	n.a.	n.a.	n.a.	n.a.	0.09
Ah	5.07	8.6	0.50	0.8	12.3	22.0	2.9	1.2	2.2	1.8	4.3	2.0	67.0	42	n.a.	n.a.	n.a.	n.a.	0.87
Aej	4.60	0.4	0.08	9.1	18.5	6.9	1.4	0.3	0.6	50.4	1.2	125.5	18.1	50	n.a.	30	30	40	1.26
Bm1	4.62	0.7	0.06	4.1	18.6	7.0	1.6	0.2	0.5	37.9	0.7	81.4	22.6	41	n.a.	36	24	40	1.34
Bm2	4.46	0.6	0.05	4.8	20.5	4.3	1.2	0.2	0.5	36.8	0.6	70.1	15.9	39	n.a.	38	28	34	1.50
Bm3	4.43	0.2	0.02	6.6	19.8	2.1	0.6	0.1	0.4	24.7	0.8	73.1	11.1	29	n.a.	74	6	20	1.56
BC	4.45	0.5	0.05	8.6	18.9	6.3	1.8	0.2	0.6	36.4	0.8	63.9	21.2	42	n.a.	46	12	42	1.41
C	4.57	0.6	0.06	5.0	21.8	8.5	2.5	0.3	0.6	37.0	0.8	59.5	27.0	44	n.a.	14	40	46	1.52

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 933, Orthic Luvic Gleysol

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	4.01	50.9	0.75	42.4	77.5	18.8	4.5	1.5	4.1	1.2	2.9	0.0	65.9	n.d.	n.a.	n.a.	n.a.	n.a.	0.68
F	4.61	47.4	1.45	141.0	67.5	40.6	6.6	2.2	4.0	2.6	6.4	7.7	98.3	n.d.	n.a.	n.a.	n.a.	n.a.	0.68
H	4.26	37.6	1.20	100.2	104.2	36.6	5.1	1.6	4.0	1.2	3.9	0.8	160.0	n.d.	n.a.	n.a.	n.a.	n.a.	0.68
Ahe	3.68	2.1	0.11	9.4	19.3	2.9	1.9	0.4	0.3	76.0	7.6	161.9	23.9	23	n.a.	18	32	50	1.01
Aej	3.94	0.6	0.04	2.8	20.5	0.9	0.6	0.1	0.2	40.4	1.6	82.2	13.8	14	n.a.	26	42	32	n.d.
Btg1	4.04	0.7	0.05	3.6	22.1	5.7	3.5	0.3	0.3	126.6	0.8	508.2	36.4	27	n.a.	20	24	56	1.29
Btg2	4.44	0.6	0.05	3.0	53.9	9.4	5.5	0.4	2.3	80.2	0.7	128.2	35.9	49	n.a.	10	36	54	1.12
Bt	6.36	1.0	0.07	2.5	148.9	14.5	6.5	0.3	0.8	46.9	0.8	61.4	35.2	63	n.a.	0	36	64	1.23
Cca	6.75	1.3	0.07	2.2	195.8	21.8	4.9	0.3	1.5	42.7	0.8	106.5	38.8	73	2	10	36	54	1.30

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

Chemical and physical properties of soil horizons in compartment 859, Black Solodized Solonetz

Horizon	pH	Total (%)		Extractable (mg/kg)		Exchangeable (cmol(+)/kg)				Digestible or extractable[a] (cmol(+)/kg)			CEC (cmol(+)/kg)	Base saturation (%)	$CaCO_3$ (%)	Particle size (%)			Bulk density[b] (g/cm^3)
		C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al				Sand	Silt	Clay	
L	5.94	49.3	1.73	110.2	29.0	57.6	14.5	3.7	2.6	1.8	12.6	5.0	96.7	n.d.	n.a.	n.a.	n.a.	n.a.	0.11
F	5.49	47.6	2.26	66.9	86.5	74.1	13.0	3.0	2.5	21.2	31.6	91.4	157.5	n.d.	n.a.	n.a.	n.a.	n.a.	0.11
H	5.82	34.0	1.72	19.8	29.5	70.9	9.4	1.8	2.4	1.1	6.7	0.0	134.0	n.d.	n.a.	n.a.	n.a.	n.a.	0.11
Ah	5.58	4.4	0.40	14.9	22.4	11.4	2.0	0.9	0.6	60.1	19.8	104.7	32.7	46	n.a.	22	34	44	0.87
Ahe	Horizon not sampled																		
Ae	4.49	0.4	0.06	2.8	18.1	2.1	0.7	0.1	0.5	21.7	0.9	46.7	12.8	26	n.a.	20	46	34	1.51
AB	4.24	0.5	0.05	2.7	19.8	3.6	1.4	0.2	0.5	45.9	0.7	100.7	21.0	27	n.a.	16	40	44	1.35
Bnt	4.08	0.6	0.06	3.5	21.2	4.5	1.8	0.2	0.5	61.5	0.7	69.9	20.7	34	n.a.	12	36	52	1.30
Bt	4.12	0.8	0.07	4.0	17.5	8.2	3.5	0.3	0.6	50.3	0.8	64.9	31.4	40	n.a.	14	26	60	1.36
BC	4.42	0.8	0.06	3.7	19.0	7.7	3.1	0.3	0.6	22.6	1.1	14.7	30.6	38	n.a.	20	22	58	1.31
C	5.68	0.8	0.05	3.6	20.4	8.9	3.3	0.2	0.6	77.4	3.6	80.6	31.2	42	n.a.	18	28	54	1.28

[a]Total digestible for forest floor horizons (L, F, and H), sodium pyrophosphate extractable for mineral soil horizons.

[b]For forest floor horizons, values shown are the mean of the L, F, and H horizon values in Kishchuk, B.E. 2002. Nutritional responses to harvesting and burning in the Ecosystem Management Emulating Natural Disturbance (EMEND) experiment. [Final report for soil and nutritional research in the EMEND experiment 1999–2000 under collaborative research agreement with Weyerhaeuser Canada Ltd.] Prepared for Weyerhaeuser Canada Ltd., Edmonton, AB., Unpubl. Rep. For additional explanation, see the Methods section.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate, n.d. = not determined, n.a. = not applicable.

APPENDIX 6

Physical and Chemical Properties of Mineral Soil Horizons (Not Shown in Table 5)

Properties of Ahb horizon (n = 1)

Property	Value
pH	5.85
C (%)	5.2
N (%)	0.4
P (mg/kg)	5.8
S (mg/kg)	19.4
Ca (cmol(+)/kg)	19.0
Mg (cmol(+)/kg)	3.3
K (cmol(+)/kg)	0.3
Mn (cmol(+)/kg)	2.5
Na (cmol(+)/kg)	0.8
Fe (cmol(+)/kg)	72.5
Al (cmol(+)/kg)	100.7
CEC (cmol(+)/kg)	48.7
Base saturation (%)	48
$CaCO_3$ (%)	n.d.
Sand (%)	14
Silt (%)	34
Clay (%)	52
Bulk density (g/cm^3)	0.90

Note: C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, n.d. = not determined, $CaCO_3$ = calcium carbonate.

Properties of Ahe horizon (n = 12)

Property	Mean (SD)	Minimum	Maximum
pH	4.87 (0.65)	3.68	6.17
C (%)	2.7 (1.2)	1.0	5.1
N (%)	0.2 (0.1)	0.1	0.4
P (mg/kg)	20.5 (19.9)	5.5	80.0
S (mg/kg)	43.7 (69.5)	19.3	264.1
Ca (cmol(+)/kg)	6.5 (4.1)	2.6	15.7
Mg (cmol(+)/kg)	1.9 (1.1)	0.6	4.3
K (cmol(+)/kg)	0.4 (0.2)	0.2	0.9
Mn (cmol(+)/kg)	9.8 (7.6)	1.8	25.1
Na (cmol(+)/kg)	0.5 (0.1)	0.3	0.6
Fe (cmol(+)/kg)	54.8 (18.4)	30.0	97.1
Al (cmol(+)/kg)	88.6 (50.5)	38.1	202.2
CEC (cmol(+)/kg)	24.9 (9.3)	9.0	42.3
Base saturation (%)	37 (11)	23	56
$CaCO_3$ (%)	n.d.	n.d.	n.d.
Sand (%)	23 (11)	10	52
Silt (%)	36 (11)	20	64
Clay (%)	41 (12)	20	60
Bulk density (g/cm^3)	0.99 (0.26)	0.64	1.45

Note: SD = standard deviation, C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, n.d. = not determined, $CaCO_3$ = calcium carbonate.

Properties of Aej horizon (n = 5)

Property	Mean (SD)	Minimum	Maximum
pH	4.76 (0.73)	3.94	5.94
C (%)	1.2 (0.8)	0.4	2.3
N (%)	0.10 (0.04)	0.0	0.1
P (mg/kg)	7.3 (3.8)	2.8	12.8
S (mg/kg)	22.1 (2.6)	18.5	24.4
Ca (cmol(+)/kg)	5.7 (3.4)	0.9	10.4
Mg (cmol(+)/kg)	1.2 (0.4)	0.6	1.5
K (cmol(+)/kg)	0.2 (0.1)	0.1	0.3
Mn (cmol(+)/kg)	1.2 (0.3)	1.0	1.6
Na (cmol(+)/kg)	0.4 (0.1)	0.2	0.6
Fe (cmol(+)/kg)	50.5 (11.5)	39.4	67.2
Al (cmol(+)/kg)	98.3 (40.0)	63.9	154.3
CEC (cmol(+)/kg)	20.2 (5.3)	13.8	27.9
Base saturation (%)	36 (14)	14	50
$CaCO_3$ (%)	n.d.	n.d.	n.d
Sand (%)	25 (6)	18	60
Silt (%)	33 (10)	18	42
Clay (%)	42 (7)	32	52
Bulk density (g/cm^3)	1.02 (0.35)	0.78	1.26

Note: SD = standard deviation, C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, n.d. = not determined, $CaCO_3$ = calcium carbonate.

Properties of AB horizon (n = 2)

Property	Mean (SD)	Minimum	Maximum
pH	4.61 (0.08)	4.55	4.67
C (%)	0.6 (0.2)	0.5	0.7
N (%)	0.10 (0.01)	0.05	0.10
P (mg/kg)	4.8 (1.0)	4.1	5.5
S (mg/kg)	20.1 (0.5)	19.8	20.5
Ca (cmol(+)/kg)	2.9 (0.3)	2.7	3.1
Mg (cmol(+)/kg)	1.7 (0.0)	1.7	1.7
K (cmol(+)/kg)	0.2 (0.03)	0.2	0.2
Mn (cmol(+)/kg)	0.5 (0.1)	0.5	0.6
Na (cmol(+)/kg)	0.4 (0.1)	0.3	0.5
Fe (cmol(+)/kg)	38.3 (7.4)	33.1	43.6
Al (cmol(+)/kg)	63.6 (13.0)	54.4	72.7
CEC (cmol(+)/kg)	17.7 (7.7)	12.2	23.1
Base saturation (%)	32 (13)	22	41
$CaCO_3$ (%)	n.d.	n.d	n.d
Sand (%)	16 (8)	10	22
Silt (%)	42 (6)	38	46
Clay (%)	42 (3)	40	44
Bulk density (g/cm^3)	1.56 (0.00)	1.56	1.56

Note: SD = standard deviation, C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, n.d. = not determined, $CaCO_3$ = calcium carbonate.

Properties of Bnt horizon (n = 1)

Property	Value
pH	4.08
C (%)	0.6
N (%)	0.1
P (mg/kg)	3.5
S (mg/kg)	21.2
Ca (cmol(+)/kg)	4.5
Mg (cmol(+)/kg)	1.8
K (cmol(+)/kg)	0.2
Mn (cmol(+)/kg)	0.7
Na (cmol(+)/kg)	0.5
Fe (cmol(+)/kg)	61.5
Al (cmol(+)/kg)	69.9
CEC (cmol(+)/kg)	20.7
Base saturation (%)	34
$CaCO_3$ (%)	n.d.
Sand (%)	12
Silt (%)	36
Clay (%)	52
Bulk density (g/cm^3)	1.34

Note: C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, n.d. = not determined, $CaCO_3$ = calcium carbonate.

Properties of Bf horizon (n = 1)

Property	Value
pH	5.03
C (%)	0.6
N (%)	0.1
P (mg/kg)	7.9
S (mg/kg)	19.8
Ca (cmol(+)/kg)	2.2
Mg (cmol(+)/kg)	1.0
K (cmol(+)/kg)	0.1
Mn (cmol(+)/kg)	2.5
Na (cmol(+)/kg)	0.3
Fe (cmol(+)/kg)	27.6
Al (cmol(+)/kg)	81.9
CEC (cmol(+)/kg)	15.2
Base saturation (%)	30
$CaCO_3$ (%)	n.d.
Sand (%)	32
Silt (%)	34
Clay (%)	34
Bulk density (g/cm^3)	1.34

Note: C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, n.d. = not determined, $CaCO_3$ = calcium carbonate.

Properties of Btg horizon (n = 2)

Property	Mean (SD)	Minimum	Maximum
pH	4.24 (0.28)	4.04	4.44
C (%)	0.6 (0.1)	0.6	0.7
N (%)	0.1 (0.0)	0.1	0.1
P (mg/kg)	3.3 (0.4)	3.0	3.6
S (mg/kg)	38.0 (22.5)	22.1	53.9
Ca (cmol(+)/kg)	7.6 (2.6)	5.7	9.4
Mg (cmol(+)/kg)	4.5 (1.4)	3.5	5.5
K (cmol(+)/kg)	0.3 (0.04)	0.3	0.4
Mn (cmol(+)/kg)	0.8 (0.04)	0.7	0.8
Na (cmol(+)/kg)	1.3 (1.4)	0.3	2.3
Fe (cmol(+)/kg)	103.4 (32.8)	80.2	126.6
Al (cmol(+)/kg)	318.2 (268.7)	128.2	508.2
CEC (cmol(+)/kg)	36.2 (0.4)	35.9	36.4
Base saturation (%)	38 (16)	27	49
$CaCO_3$ (%)	n.d.	n.d.	n.d.
Sand (%)	15 (7)	10	20
Silt (%)	30 (8)	24	36
Clay (%)	55 (1)	54	56
Bulk density (g/cm^3)	1.21 (0.12)	1.12	1.29

Note: SD = standard deviation, C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, n.d. = not determined, $CaCO_3$ = calcium carbonate.

Properties of Btj horizon ($n = 4$)

Property	Mean (SD)	Minimum	Maximum
pH	5.19 (0.83)	4.39	6.32
C (%)	0.8 (0.2)	0.5	1.0
N (%)	0.1 (0.03)	0.1	0.1
P (mg/kg)	8.0 (1.9)	5.3	9.5
S (mg/kg)	38.6 (17.8)	25.3	64.9
Ca (cmol(+)/kg)	10.8 (2.6)	7.9	14.1
Mg (cmol(+)/kg)	3.5 (0.6)	2.8	4.1
K (cmol(+)/kg)	0.4 (0.1)	0.3	0.5
Mn (cmol(+)/kg)	0.8 (0.1)	0.6	0.9
Na (cmol(+)/kg)	0.5 (0.1)	0.3	0.6
Fe (cmol(+)/kg)	99.6 (25.2)	66.8	126.3
Al (cmol(+)/kg)	253.7 (128.4)	135.0	408.6
CEC (cmol(+)/kg)	34.0 (5.6)	26.0	38.5
Base saturation (%)	45 (2)	41	47
$CaCO_3$ (%)	n.d	n.d.	n.d.
Sand (%)	11 (3)	8	14
Silt (%)	30 (12)	22	48
Clay (%)	60 (15)	38	70
Bulk density (g/cm^3)	1.25 (0.09)	1.18	1.38

Note: SD = standard deviation, C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, n.d. = not determined, $CaCO_3$ = calcium carbonate.

Properties of Btnj horizon (n = 2)

Property	Mean (SD)	Minimum	Maximum
pH	4.18 (0.18)	4.05	4.31
C (%)	0.5 (0.01)	0.5	0.5
N (%)	0.06 (0.02)	0.04	0.07
P (mg/kg)	6.8 (3.3)	4.5	9.1
S (mg/kg)	28.3 (14.1)	18.3	38.3
Ca (cmol(+)/kg)	4.3 (1.5)	3.3	5.4
Mg (cmol(+)/kg)	2.5 (0.05)	2.5	2.5
K (cmol(+)/kg)	0.2 (0.1)	0.2	0.3
Mn (cmol(+)/kg)	0.6 (0.1)	0.5	0.7
Na (cmol(+)/kg)	0.6 (0.0)	0.6	0.6
Fe (cmol(+)/kg)	42.8 (2.3)	41.2	44.4
Al (cmol(+)/kg)	101.8 (1.4)	100.8	102.8
CEC (cmol(+)/kg)	23.0 (0.3)	22.7	23.2
Base saturation (%)	33 (7)	28	38
$CaCO_3$ (%)	n.d.	n.d.	n.d.
Sand (%)	23 (7)	18	28
Silt (%)	30 (3)	28	32
Clay (%)	47 (10)	40	54
Bulk density (g/cm^3)	1.24 (0.01)	1.23	1.25

Note: SD = standard deviation, C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, n.d. = not determined, $CaCO_3$ = calcium carbonate.

Properties of BC horizon (n = 15)

Property	Mean (SD)	Minimum	Maximum
pH	5.01 (0.91)	3.93	6.50
C (%)	0.7 (0.2)	0.4	0.9
N (%)	0.1 (0.1)	0.0	0.4
P (mg/kg)	7.4 (3.6)	3.4	15.4
S (mg/kg)	27.5 (9.8)	18.9	48.6
Ca (cmol(+)/kg)	8.4 (2.4)	3.9	12.0
Mg (cmol(+)/kg)	3.2 (0.8)	1.8	5.0
K (cmol(+)/kg)	0.3 (0.1)	0.2	0.3
Mn (cmol(+)/kg)	2.1 (4.9)	0.5	19.6
Na (cmol(+)/kg)	0.6 (0.1)	0.3	0.7
Fe (cmol(+)/kg)	53.0 (23.6)	22.6	102.2
Al (cmol(+)/kg)	95.1 (65.4)	14.7	206.4
CEC (cmol(+)/kg)	27.2 (4.3)	20.3	33.2
Base saturation (%)	46 (10)	31	69
$CaCO_3$ (%)	n.d.	n.d.	n.d.
Sand (%)	22 (14)	4	56
Silt (%)	25 (7)	12	36
Clay (%)	53 (9)	32	68
Bulk density (g/cm^3)	1.35 (0.16)	1.04	1.59

Note: SD = standard deviation, C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, n.d. = not determined, $CaCO_3$ = calcium carbonate.

Properties of BCca horizon (n = 1)

Property	Value
pH	6.70
C (%)	1.1
N (%)	0.1
P (mg/kg)	4.0
S (mg/kg)	72.1
Ca (cmol(+)/kg)	13.4
Mg (cmol(+)/kg)	6.6
K (cmol(+)/kg)	0.3
Mn (cmol(+)/kg)	0.7
Na (cmol(+)/kg)	0.9
Fe (cmol(+)/kg)	18.7
Al (cmol(+)/kg)	20.7
CEC (cmol(+)/kg)	25.1
Base saturation (%)	84
$CaCO_3$ (%)	4.3
Sand (%)	16
Silt (%)	56
Clay (%)	28
Bulk density (g/cm^3)	1.45

Note: C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate.

Properties of BCk horizon (n = 8)

Property	Mean (SD)	Minimum	Maximum
pH	6.62 (0.46)	5.56	6.99
C (%)	1.1 (0.3)	0.7	1.3
N (%)	0.06 (0.01)	0.05	0.07
P (mg/kg)	4.3 (2.2)	2.1	8.1
S (mg/kg)	177.5 (123.8)	24.3	402.3
Ca (cmol(+)/kg)	21.6 (14.3)	10.7	55.2
Mg (cmol(+)/kg)	5.3 (1.2)	3.4	7.1
K (cmol(+)/kg)	0.3 (0.1)	0.2	0.4
Mn (cmol(+)/kg)	0.8 (0.3)	0.5	1.3
Na (cmol(+)/kg)	0.9 (0.3)	0.3	1.7
Fe (cmol(+)/kg)	23.2 (13.1)	7.5	47.5
Al (cmol(+)/kg)	19.7 (25.6)	0.0	75.1
CEC (cmol(+)/kg)	25.8 (5.4)	17.5	32.6
Base saturation (%)	66 (21)	50	96
$CaCO_3$ (%)	4.7 (1.3)	1.7	5.7
Sand (%)	18 (4)	12	26
Silt (%)	30 (3)	26	34
Clay (%)	53 (5)	44	62
Bulk density (g/cm^3)	1.36 (0.18)	1.05	1.62

Note: SD = standard deviation, C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate.

Properties of Cca horizon (n = 3)

Property	Mean (SD)	Minimum	Maximum
pH	6.49 (0.26)	6.24	6.75
C (%)	0.9 (0.4)	0.5	1.3
N (%)	0.05 (0.02)	0.03	0.07
P (mg/kg)	4.7 (4.1)	2.2	9.4
S (mg/kg)	83.1 (97.7)	21.7	195.8
Ca (cmol(+)/kg)	14.8 (6.7)	8.5	21.8
Mg (cmol(+)/kg)	3.6 (1.1)	3.0	4.9
K (cmol(+)/kg)	0.2 (0.1)	0.2	0.3
Mn (cmol(+)/kg)	0.8 (0.04)	0.8	0.8
Na (cmol(+)/kg)	0.8 (0.6)	0.4	1.5
Fe (cmol(+)/kg)	31.4 (11.6)	19.5	42.7
Al (cmol(+)/kg)	69.5 (44.6)	20.0	106.5
CEC (cmol(+)/kg)	28.6 (10.0)	18.8	38.8
Base saturation (%)	67 (5)	64	73
$CaCO_3$ (%)	2.9 (1.6)	1.8	4.0
Sand (%)	21 (12)	10	34
Silt (%)	32 (4)	28	36
Clay (%)	47 (8)	38	54
Bulk density (g/cm^3)	1.31 (0.03)	1.29	1.35

Note: SD = standard deviation, C = total carbon, N = total nitrogen, P = extractable phosphorous, S = extractable sulfur, Ca = exchangeable calcium, Mg = exchangeable magnesium, K = exchangeable potassium, Mn = sodium pyrophosphate extractable manganese, Na = exchangeable sodium, Fe = sodium pyrophosphate extractable iron, Al = sodium pyrophosphate extractable aluminum, CEC = cation exchange capacity, $CaCO_3$ = calcium carbonate.

APPENDIX 7

Carbon and Nutrient Content in Each Soil Horizon, with Compartments Grouped by Soil Subgroup and Stand Types within Subgroups

Carbon and nutrient content for compartment 952, Orthic Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	8230	240	0	1	180	40	20	10	10	30	20
F	15600	650	4	2	460	70	50	20	290	270	570
H	6850	270	1	1	180	20	20	10	350	120	390
Subtotal for forest floor	30680	1160	5	4	820	130	90	40	650	420	980
Standardized (kg/m^3)	38.3	1.4	0.007	0.004	1.0	0.2	0.11	0.05	0.8	0.5	1.2
Mineral soil											
Ae	10160	860	10	20	540	130	120	130	1020	310	3330
AB	10800	1250	6	30	850	320	120	170	14420	210	7640
Bt1	22420	2390	20	100	4360	2290	410	540	69580	510	54710
Bt2	13630	1200	10	130	3000	1560	220	360	34650	420	15300
Bt3	26430	1980	10	230	5590	2670	280	690	21970	530	5770
BCca	11620	730	4	80	2790	840	110	220	5430	200	1940
Ck	14830	950	6	210	3860	900	120	260	7170	370	2180
Subtotal for mineral soil	109890	9360	66	800	20990	8710	1380	2370	154240	2550	90870
Standardized (kg/m^3)	10.0	0.9	0.007	0.073	1.9	0.8	0.12	0.22	14.9	0.2	8.3
Total for profile	140570	10520	71	804	21810	8840	1470	2410	154890	2970	91850

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 907, Orthic Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	3260	50	1	1	50	10	9	4	6	6	2
F	29820	880	7	1	920	100	70	40	1550	580	1270
H	2670	120	1	0	110	10	10	7	9	30	10
Subtotal for forest floor	35750	1050	9	2	1080	120	89	51	1565	616	1282
Standardized (kg/m^2)	27.5	0.8	0.007	0.002	0.8	0.1	0.07	0.04	1.2	0.5	1.0
Mineral soil											
Ah	12860	950	20	6	620	70	160	30	5370	1420	4020
Ahe	5830	520	10	10	300	40	60	60	4860	530	1980
Ae	8010	440	30	50	700	120	110	210	11280	510	4880
Bm	17610	1610	30	70	4700	1110	360	430	35090	610	18070
Bt	10790	780	20	40	2980	680	180	220	28630	410	10110
BC	21260	1480	40	90	5380	1140	280	420	31650	840	7750
Cca	7900	450	10	30	2560	550	110	180	8220	320	2720
Subtotal for mineral soil	84260	6230	160	296	17240	3710	1260	1550	125100	4640	49530
Standardized (kg/m^2)	7.7	0.6	0.014	0.027	1.6	0.3	0.11	0.14	11.4	0.4	4.5
Total for profile	120010	7280	169	298	18320	3830	1349	1601	126665	5256	50812

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 946, Orthic Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	3170	70	1	0	40	5	6	6	9	10	30
F	17890	780	3	2	480	50	40	40	790	320	520
Subtotal for forest floor	21060	850	4	2	520	55	46	46	799	330	550
Standardized (kg/m^3)	30.1	1.2	0.006	0.003	0.7	0.1	0.07	0.07	1.1	0.5	0.8
Mineral soil											
Ah	17820	1210	9	6	630	100	80	100	2350	570	1370
Ahe	4070	300	3	5	220	50	40	30	3500	380	1620
Ae	8270	790	10	40	400	100	80	130	17210	410	6460
AB	11930	1500	10	50	1550	510	150	160	30420	390	16360
Bt1	7980	840	5	30	2310	800	210	660	32430	240	23620
Bt	18850	1400	9	70	4630	1470	290	220	50060	550	26180
BCk	21730	1500	10	70	5350	1480	220	260	33190	660	6440
Ck	35640	1050	7	60	5800	670	170	230	7160	510	1940
Subtotal for mineral soil	126290	8590	63	331	20890	5180	1240	1790	176320	3710	83990
Standardized (kg/m^3)	13.4	0.9	0.007	0.035	2.2	0.6	0.13	0.19	18.8	0.4	8.9
Total for profile	147350	9440	67	333	21410	5235	1286	1836	177119	4040	84540

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 867, Orthic Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	8710	230	2	0	150	20	30	20	30	40	30
F	25930	980	6	2	780	60	60	70	640	180	730
H	14170	600	5	2	440	40	30	50	40	50	20
Subtotal for forest floor	48810	1810	13	4	1370	120	120	140	710	270	780
Standardized (kg/m^3)	34.9	1.3	0.010	0.003	1.0	0.1	0.08	0.09	0.5	0.2	0.6
Mineral soil											
Ae	19380	1460	5	30	1670	240	180	110	16000	380	13560
Bt1	19510	1810	5	40	3550	500	200	370	32350	250	28050
Bt2	25770	2190	8	80	6140	900	290	270	52500	300	35500
Btj	23020	2390	10	150	6750	960	250	180	44520	380	34840
BC	22370	2960	10	160	7900	1150	330	230	50550	500	40720
Ck	7990	950	4	50	2930	430	110	80	15220	180	10260
Subtotal for mineral soil	118040	11760	42	510	28940	4180	1360	1240	211140	1990	162930
Standardized (kg/m^3)	12.7	1.3	0.005	0.055	3.1	0.4	0.15	0.13	22.7	0.2	17.5
Total for profile	166850	13570	55	514	30310	4300	1480	1380	211850	2260	163710

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 928, Orthic Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	1110	20	0	0	10	2	3	1	1	6	0
F	25760	780	9	2	560	50	50	30	20	100	6
H	5600	170	3	1	120	10	4	8	320	30	300
Subtotal for forest floor	32470	970	12	3	690	62	57	39	341	136	306
Standardized (kg/m^3)	20.3	0.6	0.007	0.002	0.4	0.04	0.04	0.02	0.2	0.1	0.2
Mineral soil											
Ahe	Horizon not sampled										
Ae	40540	2860	10	990	2950	670	230	390	41240	970	14870
Bt1	22040	1740	9	490	6630	2050	270	510	30530	460	5130
Bt2	25440	2230	10	940	9310	2890	340	800	28210	980	3270
BCk1	18070	690	3	280	5900	830	110	300	4160	210	140
BCk2	29010	1750	6	1000	27580	1970	350	740	5240	330	0
Subtotal for mineral soil	135100	9270	38	3700	52370	8410	1300	2740	109380	2950	23410
Standardized (kg/m^3)	12.2	0.8	0.004	0.253	4.7	0.8	0.12	0.25	9.9	0.3	2.1
Total for profile	167570	10240	50	3703	53060	8472	1357	2779	109721	3086	23716

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 904, Orthic Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	2840	60	1	1	30	5	7	3	2	7	0
F	21360	650	4	3	550	30	40	20	20	110	20
H	1880	60	1	0	40	3	2	3	30	60	30
Subtotal for forest floor	26080	770	6	4	620	38	49	26	52	177	50
Standardized (kg/m^3)	26.1	0.8	0.005	0.004	0.6	0.04	0.05	0.03	0.1	0.2	0.1
Mineral soil											
Ahe	8760	480	20	7	430	60	40	40	4000	2070	2270
Ae	3590	400	10	20	470	90	40	90	4920	920	1760
AB	5760	720	4	30	1470	330	110	160	8500	650	7770
Bt1	19710	1900	20	80	6940	1940	560	650	62650	610	60580
Bt2	15160	1550	20	70	4830	1440	420	490	62620	540	35090
BC	37010	2380	20	110	7500	2060	350	630	75040	1130	61510
C	19620	1210	7	70	4740	1390	190	340	15760	800	4460
Subtotal for mineral soil	109610	8640	101	387	26380	7310	1710	2400	233490	6720	173440
Standardized (kg/m^3)	9.6	0.8	0.009	0.033	2.3	0.6	0.15	0.21	20.5	0.6	15.2
Total for profile	135690	9410	107	391	27000	7348	1759	2426	233542	6897	173490

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 875, Orthic Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
F	47790	1160	9	8	890	70	80	50	4040	420	2520
Subtotal for forest floor	47790	1160	9	8	890	70	80	50	4040	420	2520
Standardized (kg/m^3)	34.1	0.8	0.007	0.006	0.6	0.05	0.06	0.04	2.9	0.3	1.8
Mineral soil											
Ah	29670	1660	30	6	1200	130	70	130	130	220	40
Aej	14350	820	8	20	680	90	60	50	9660	230	3720
Ae	10690	810	10	40	3130	670	130	360	25100	410	15310
Btj	18120	1330	20	60	4800	990	290	200	68040	560	81690
Bt	25530	1540	20	70	8170	1500	350	330	67490	640	58260
BC	19030	1730	9	70	5350	890	240	220	25090	580	12860
Cca	14580	870	4	50	4150	530	140	120	13000	300	10760
Subtotal for mineral soil	131970	8760	101	316	27480	4800	1280	1410	208510	2940	182640
Standardized (kg/m^3)	14.5	1.0	0.011	0.033	3.0	0.5	0.14	0.16	22.9	0.3	20.1
Total for profile	179760	9920	110	324	28370	4870	1360	1460	212550	3360	185160

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 925, Orthic Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	2370	50	1	1	30	3	5	4	2	20	1
F	15740	520	4	3	310	20	40	30	40	100	90
H	4380	140	1	1	70	4	7	9	5	6	1
Subtotal for forest floor	22490	710	6	5	410	27	52	43	47	126	92
Standardized (kg/m^3)	22.5	0.7	0.006	0.004	0.4	0.03	0.01	0.04	0.1	0.1	0.1
Mineral soil											
Ahe	Horizon not sampled										
Ae	20460	1510	10	50	850	220	110	120	22770	1250	12340
Bt1	14110	1430	9	40	2230	1120	240	630	51960	350	55230
Bt2	21350	2310	20	200	6590	3380	514	420	83994	620	39480
Bt3	32460	2790	20	630	8470	3480	400	850	35880	1220	9150
BCk	36480	1840	10	700	13670	2640	370	1210	27280	660	20750
Subtotal for mineral soil	124860	9880	69	1620	31810	10840	1634	3230	221884	4100	136950
Standardized (kg/m^3)	10.8	0.9	0.006	0.139	2.7	0.9	0.01	0.28	19.1	0.4	11.8
Total for profile	147350	10590	75	1625	32220	10867	1686	3273	221931	4226	137042

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 856, Dark Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	18730	720	4	1	600	60	70	30	70	30	20
F	37380	1790	10	2	1440	120	100	50	2930	230	1420
H	3470	280	1	0	290	7	3	10	8	20	1
Subtotal for forest floor	59580	2790	15	3	2330	187	173	90	3008	280	1441
Standardized (kg/m^3)	39.7	1.9	0.010	0.002	1.6	0.1	0.11	0.06	2.0	0.2	1.0
Mineral soil											
Ae	Horizon not sampled										
Ah	68020	5230	5	20	4270	150	90	50	17070	490	8020
Aej	2870	230	2	8	680	60	20	30	6140	90	4540
Bm	11520	870	10	50	3230	370	140	480	27380	400	11860
Bt1	20090	1310	10	60	4920	690	220	150	43290	590	25080
Bt2	13800	940	9	40	3520	570	140	110	17990	360	4220
BCk	23280	1610	20	80	8480	1320	310	240	24950	930	2990
Subtotal for mineral soil	139580	10190	56	258	25100	3160	920	1060	136820	2860	56710
Standardized (kg/m^3)	16.0	1.2	0.007	0.029	2.9	0.4	0.11	0.12	15.7	0.3	6.5
Total for profile	199160	12980	71	261	27430	3347	1093	1150	139828	3140	58151

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 888, Dark Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	2950	60	1	1	40	7	10	3	2	6	0
F	19020	650	5	3	500	50	50	20	30	90	70
H	5430	220	2	1	130	10	9	9	180	205	280
Subtotal for forest floor	27400	930	8	5	670	67	69	32	212	301	350
Standardized (kg/m^3)	24.9	0.8	0.007	0.005	0.6	0.1	0.07	0.03	0.2	0.3	0.3
Mineral soil											
Ahe	17430	1370	10	20	680	80	110	70	8770	2450	5040
Ae	8180	840	6	20	540	90	70	130	10340	690	4530
Bt1	14990	1470	8	50	2980	650	210	310	29560	400	19700
Bt2	19870	1540	10	50	5040	1090	350	400	39240	350	36660
BC	21780	10300	20	60	5620	1100	270	410	53330	720	33200
Ck	11830	510	2	20	4450	440	100	170	4690	200	2240
Subtotal for mineral soil	94080	16030	56	220	19310	3450	1110	1490	145930	4810	101370
Standardized (kg/m^3)	10.0	1.7	0.006	0.023	2.1	0.4	0.12	0.16	15.5	0.5	10.8
Total for profile	121480	16960	64	225	19980	3517	1179	1522	146142	5111	101720

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 961, Dark Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	3060	50	1	0	20	5	4	2	3	10	1
F	11460	290	1	1	260	30	20	10	8	30	1
H	Horizon not sampled										
Subtotal for forest floor	14520	340	2	1	280	35	24	12	11	40	2
Standardized (kg/m^3)	29.0	0.7	0.003	0.003	0.6	0.1	0.06	0.03	0.02	0.1	0.003
Mineral soil											
Ahe	17150	840	3	10	510	90	70	40	4360	240	1830
Aej	11440	740	4	10	570	110	80	70	6820	180	3560
Bt1	16050	1420	7	60	3330	720	290	260	14590	690	1930
Bt2	22330	1740	10	1160	8070	1750	260	570	12850	610	1340
BCk	39230	1760	7	610	11840	1890	270	590	11490	490	700
Ck	36860	1680	5	1290	31520	1970	320	650	6110	440	2920
Subtotal for mineral soil	143060	8180	36	3140	55840	6530	1290	2180	56220	2650	12280
Standardized (kg/m^3)	12.8	0.7	0.003	0.281	5.0	0.6	0.11	0.19	5.0	0.2	1.1
Total for profile	157580	8520	38	3141	56120	6565	1314	2192	56231	2690	12282

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 954, Dark Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	9610	180	2	3	110	30	30	10	10	30	0
F	18230	620	5	2	470	60	50	30	40	70	30
Subtotal for forest floor	27840	800	7	5	580	90	80	40	50	100	30
Standardized (kg/m^3)	46.4	1.3	0.013	0.008	1.0	0.2	0.14	0.06	0.1	0.2	0.04
Mineral soil											
Ah	38860	2620	10	10	1250	190	230	90	15110	4350	5360
Ahe	6080	530	5	9	260	50	50	50	7980	420	2040
Ae	2880	310	7	20	220	50	40	110	6670	160	1630
Bt1	19190	2280	10	70	4460	1530	400	420	52610	560	24390
Bt2	13000	1440	10	50	3560	1220	270	360	61490	430	32660
Bt3	13670	1170	9	40	2850	950	200	290	38350	330	28040
BC	25940	2040	20	110	5210	1560	270	530	46940	570	12500
Subtotal for mineral soil	119620	10390	71	309	17810	5550	1460	1850	229150	6820	106620
Standardized (kg/m^3)	11.4	1.0	0.008	0.030	1.7	0.5	0.14	0.18	21.8	0.6	10.2
Total for profile	147460	11190	78	314	18390	5640	1540	1890	229200	6920	106650

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 900, Dark Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	4820	170	1	1	100	20	20	5	5	10	2
F	36190	1690	4	5	1110	170	70	50	50	200	20
Subtotal for forest floor	41010	1860	5	6	1210	190	90	55	55	210	22
Standardized (kg/m^3)	45.6	2.1	0.005	0.007	1.4	0.2	0.10	0.06	0.1	0.2	0.02
Mineral soil											
Ah	Horizon not sampled										
Ahe	Horizon not sampled										
Ae	36090	2520	30	70	15560	200	120	330	26680	3050	10460
Bt1	23250	2320	8	60	3690	820	280	340	44940	460	24560
Bt2	19000	1840	8	70	3340	980	310	360	57270	400	50320
BC	22580	2430	8	120	3300	1110	300	370	45410	360	27770
C	12000	1100	9	40	2080	710	170	240	36400	300	33320
Subtotal for mineral soil	112920	10210	63	360	27970	3820	1180	1640	210700	4570	146430
Standardized (kg/m^3)	11.1	1.0	0.006	0.034	1.4	0.4	0.12	0.16	210760.0	0.4	14.4
Total for profile	153930	12070	68	366	29180	4010	1270	1695	210755	4780	146452

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 908, Dark Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	5480	220	1	1	100	30	20	7	10	20	7
F	41190	1840	7	5	1090	200	100	60	140	240	40
Subtotal for forest floor	46670	2060	8	6	1190	230	120	67	150	260	47
Standardized (kg/m^3)	46.7	2.1	0.008	0.006	1.2	0.2	0.11	0.07	0.2	0.3	0.1
Mineral soil											
Ahe	28980	2290	5	20	860	170	190	100	10550	1090	4740
Ae	5290	690	2	10	220	55	50	50	6930	210	4670
Bt1	36340	4700	10	70	2170	700	370	430	58950	460	41180
Bt2	11610	1360	7	50	1480	560	200	260	26030	340	33600
BC	27280	3340	30	80	3230	1250	400	580	64720	1070	77420
C	11480	1280	10	30	1080	410	120	210	16730	510	20500
Subtotal for mineral soil	120980	13660	64	260	9040	3145	1330	1630	183910	3680	182110
Standardized (kg/m^3)	11.3	1.3	0.007	0.024	0.8	0.3	0.13	0.15	17.2	0.3	17.0
Total for profile	167650	15720	72	266	10230	3375	1450	1697	184060	3940	182157

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 937, Dark Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
F	16100	500	3	2	290	40	20	20	2000	780	950
H	2510	120	1	0	64	10	4	6	6	20	1
Subtotal for forest floor	18610	620	4	2	354	50	24	26	2006	800	951
Standardized (kg/m^3)	23.3	0.8	0.005	0.003	0.4	0.1	0.03	0.03	2.5	1.0	1.2
Mineral soil											
Ah	31790	2630	8	20	810	170	140	60	20380	970	7010
Ae	17440	1730	9	30	1010	280	120	140	27580	780	11340
Bt1	13350	1500	7	40	1810	570	200	180	25640	320	9800
Bt2	14400	1330	7	40	2480	700	220	210	26030	270	16130
Bt3	23570	2130	10	70	6850	1800	400	450	37660	480	8740
Bt4	28490	2350	20	100	8300	1880	400	570	30900	740	16410
Ck	20530	1420	7	80	5880	830	240	290	6370	370	3730
Subtotal for mineral soil	149570	13090	68	380	27140	6230	1720	1900	174560	3930	73160
Standardized (kg/m^3)	13.4	1.2	0.006	0.034	2.4	0.6	0.15	0.17	15.6	0.3	6.5
Total for profile	168180	13710	72	382	27494	6280	1744	1926	176566	4730	74111

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 923, Dark Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	2970	40	0	0	30	4	5	3	6	10	30
F	20910	470	2	10	370	40	30	20	1550	330	1300
H	8020	310	2	20	390	40	8	20	17	40	5
Subtotal for forest floor	31900	820	4	30	790	84	43	43	1573	380	1335
Standardized (kg/m^3)	22.8	0.6	0.003	0.022	0.6	0.1	0.03	0.03	1.1	0.3	1.0
Mineral soil											
Ahe	27000	1690	10	320	3270	630	170	140	17810	600	13120
Ae	6390	650	5	150	1250	290	80	100	10740	270	2840
Bt1	3500	380	1	100	1390	370	70	80	8390	130	1430
Bt2	16230	1390	9	340	6270	1620	280	320	43860	540	33370
Bt3	13540	870	5	210	4910	1170	190	240	13450	350	3780
BCk	17500	1350	9	290	6240	1500	240	330	20340	460	7880
Ck	23800	1200	7	260	7650	1360	240	280	13050	440	9230
Subtotal for mineral soil	107960	7530	46	1670	30980	6940	1270	1490	127640	2790	71650
Standardized (kg/m^3)	10.3	0.7	0.004	0.159	3.0	0.7	0.12	0.14	12.2	0.3	6.8
Total for profile	139860	8350	50	1700	31770	7024	1313	1533	129213	3170	72985

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 911, Solonetzic Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	3130	40	1	0	40	10	6	3	5	20	4
F	25090	580	3	5	510	50	50	30	130	40	150
H	2480	50	0	0	40	6	4	3	3	6	1
Subtotal for forest floor	30700	670	4	5	590	66	60	36	138	66	155
Standardized (kg/m^3)	27.9	0.6	0.003	0.006	0.5	0.1	0.05	0.03	0.1	0.1	0.1
Mineral soil											
Ae	8190	340	10	10	140	70	50	40	5900	110	1770
Bmj	19580	1480	30	140	2410	1100	260	470	45840	730	33510
Bt1	16770	1370	20	570	5540	2260	270	380	55060	790	44310
Bt2	15000	960	10	570	3730	1330	170	250	11620	650	2240
BCk	35780	1360	20	600	1010	1880	300	410	14580	980	1830
Ck	59870	2100	30	850	16810	2940	460	670	16020	700	3300
Subtotal for mineral soil	155190	7610	120	2740	29640	9580	1510	2220	149020	3960	86960
Standardized (kg/m^3)	13.6	0.7	0.011	0.241	3.4	0.8	0.13	0.19	13.1	0.3	7.6
Total for profile	185890	8280	124	2745	30230	9646	1570	2256	149158	4026	87115

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 919, Solonetzic Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	5710	110	1	2	70	10	20	6	20	40	30
F	23260	710	10	4	530	40	40	30	20	60	0
Subtotal for forest floor	28970	820	11	6	600	50	60	36	40	100	30
Standardized (kg/m^3)	24.1	0.7	0.009	0.005	0.5	0.0	0.05	0.03	0.03	0.1	0.02
Mineral soil											
Ahe	12620	800	9	9	470	70	70	50	5390	1470	2300
Ae	10860	1300	9	40	810	210	150	190	17790	380	10200
Btnj	9910	1330	8	30	2050	580	220	250	21870	270	17590
Bt1	11000	2210	10	40	2990	820	270	290	35910	360	21680
Bt2	24270	2710	20	50	4550	1180	310	400	37510	450	27720
BC	23440	1820	20	50	4710	1100	260	360	27940	400	9400
C	18050	1560	10	40	4180	910	190	290	15650	280	6240
Subtotal for mineral soil	110150	11730	86	259	19760	4870	1470	1830	162060	3610	95130
Standardized (kg/m^3)	10.0	1.1	0.009	0.024	1.8	0.4	0.13	0.17	14.7	0.3	8.7
Total for profile	139120	12550	97	265	20360	4920	1530	1866	162100	3710	95160

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 880, Podzolic Gray Luvisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	4650	120	0	1	70	10	10	5	10	20	8
F	10290	420	2	1	290	40	20	20	250	240	160
Subtotal for forest floor	14940	540	2	2	360	50	30	25	260	260	168
Standardized (kg/m^3)	37.3	1.3	0.005	0.003	0.9	0.1	0.09	0.05	0.7	0.7	0.4
Mineral soil											
Ah	28020	580	10	3	1140	110	90	90	70	130	30
Ahe	13230	1040	10	20	600	90	80	40	7990	3280	2750
Ae1	1950	260	5	10	280	90	30	30	3950	440	3870
Bf	3600	330	5	10	290	80	20	50	5060	440	4840
Ae2	3960	380	5	10	360	90	30	80	5230	270	2040
Bt	21550	2340	30	60	3340	1230	320	190	35320	850	31170
Bm	7400	680	20	40	960	330	80	100	36250	360	48260
BC	18130	1390	70	110	4400	1400	300	620	132630	25040	69310
C	57460	600	30	30	1320	400	100	510	25930	300	20930
Subtotal for mineral soil	155300	7600	185	293	12690	3820	1050	1710	252430	31110	183200
Standardized (kg/m^3)	14.4	0.7	0.016	0.028	1.2	0.4	0.10	0.16	23.4	2.9	17.0
Total for profile	170240	8140	187	295	13050	3870	1080	1735	252690	31370	183368

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.

Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 850, Orthic Melanic Brunisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	8690	250	3	1	170	30	20	20	10	10	0
F	25730	1090	4	1	1080	100	50	60	1250	200	770
H	4040	240	1	0	220	20	7	10	10	5	2
Subtotal for forest floor	38460	1580	8	2	1470	150	77	90	1270	215	772
Standardized (kg/m^3)	38.5	1.6	0.008	0.003	1.5	0.1	0.08	0.09	1.3	0.2	0.8
Mineral soil											
Ah	70730	6410	10	30	6090	580	260	280	20310	1900	6280
Bm1	11190	710	3	10	950	110	40	30	7280	250	3640
Ahb	47000	3250	5	20	3430	360	110	160	18280	610	8180
Bm2	17130	1120	10	50	3470	540	190	210	33030	860	9160
Bm3	23870	1620	10	50	4700	900	260	440	37230	650	20760
Bm4	18050	1440	20	50	4630	950	240	380	37100	650	19020
BC	13830	1070	10	50	4220	1080	200	200	19390	510	6900
Ck	9110	840	9	30	2820	630	120	150	11370	420	9490
Subtotal for mineral soil	210910	16460	77	290	30310	5150	1420	1850	183990	5850	83430
Standardized (kg/m^3)	19.9	1.6	0.008	0.027	2.9	0.5	0.13	0.17	17.4	0.6	7.9
Total for profile	249370	18040	85	292	31780	5300	1497	1940	185260	6065	84202

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 892, Orthic Sombric Brunisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
F	23290	830	3	2	650	70	40	30	390	40	510
H	16360	580	3	2	510	60	20	20	100	80	460
Subtotal for forest floor	39650	1410	6	4	1160	130	60	50	490	120	970
Standardized (kg/m^3)	33.1	1.2	0.005	0.003	1.0	0.1	0.05	0.04	0.4	0.1	0.8
Mineral soil											
Ah	60630	5450	9	20	3550	600	140	110	29760	1320	9330
AB	28060	2630	20	70	5930	1330	310	290	37390	510	11830
Bm1	21070	1440	20	70	5280	1140	260	230	34280	460	10170
Bm2	18630	1370	20	60	4180	870	210	190	24920	350	9020
BC	38540	3150	40	120	9530	1950	470	420	44920	1720	14430
C	11060	1010	10	40	3140	630	160	150	18780	320	8730
Subtotal for mineral soil	177990	15050	119	380	31610	6520	1550	1390	190050	4680	63510
Standardized (kg/m^3)	16.3	1.4	0.010	0.034	2.9	0.6	0.14	0.13	17.4	0.4	5.8
Total for profile	217640	16460	125	384	32770	6650	1610	1440	190540	4800	64480

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 940, Eluviated Dystric Brunisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	6340	90	1	0	140	20	20	8	40	20	60
F	19240	420	4	1	480	60	407	20	520	200	640
H	4870	170	2	1	180	20	10	10	8	30	1
Subtotal for forest floor	30450	680	7	2	800	100	437	38	568	250	701
Standardized (kg/m^3)	25.4	0.6	0.006	0.002	0.7	0.1	0.06	0.04	0.5	0.2	0.6
Mineral soil											
Ah	32820	2310	10	9	1290	180	150	50	6680	110	5590
Ahe	17880	1440	9	10	1110	160	120	50	9510	1570	6380
Ae	5920	570	3	6	430	80	50	30	7480	180	5030
Btj1	9510	2330	20	60	2840	610	310	220	47990	360	21780
Btj2	33610	3380	30	110	7140	1700	600	480	119360	770	93930
BC	15570	1480	20	70	3530	840	240	270	49400	460	28290
C	37540	2990	50	120	7310	1640	480	490	100370	1000	75930
Subtotal for mineral soil	152850	14500	142	385	23650	5210	1950	1590	340790	4450	236930
Standardized (kg/m^3)	15.6	1.5	0.015	0.039	2.4	0.5	0.20	0.16	34.8	0.5	24.2
Total for profile	183300	15180	149	387	24450	5310	2387	1628	341358	4700	237631

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 896, Eluviated Dystric Brunisol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	8460	270	0	0	180	30	30	10	7	20	1
F	56690	2390	9	10	1870	210	160	70	2390	1390	780
Subtotal for forest floor	65150	2660	9	10	2050	240	190	80	2397	1410	781
Standardized (kg/m^3)	40.7	1.7	0.006	0.009	1.3	0.1	0.12	0.05	1.0	0.9	0.5
Mineral soil											
Ah	59930	3620	1	9	3070	250	330	350	350	820	130
Aej	3700	810	9	20	1410	170	100	130	14210	330	11410
Bm1	19070	1680	10	50	3940	540	240	350	29690	510	20520
Bm2	14890	1350	10	60	2360	400	160	300	27830	440	17060
Bm3	2650	220	7	20	460	80	40	110	7530	240	7160
BC	6840	630	10	20	1600	280	100	170	12980	270	7290
C	24010	2250	20	80	6390	1160	410	550	38790	780	20080
Subtotal for mineral soil	131090	10560	67	259	19230	2880	1380	1960	131300	3390	83650
Standardized (kg/m^3)	12.6	1.0	0.007	0.025	1.8	0.3	0.13	0.19	13.6	0.3	8.0
Total for profile	196240	13220	76	269	21280	3120	1570	2040	133697	4800	84431

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 933, Orthic Luvic Gleysol

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	3450	50	0	1	30	4	4	6	2	5	0
F	28940	880	9	4	500	50	50	60	40	110	40
H	5100	160	1	1	100	8	8	10	5	10	1
Subtotal for forest floor	37490	1090	10	6	630	62	62	76	47	125	41
Standardized (kg/m^3)	31.2	0.9	0.009	0.005	0.5	0.1	0.05	0.06	0.04	0.1	0.04
Mineral soil											
Ahe	6030	320	3	5	170	70	40	20	6110	600	4190
Aej	4860	300	2	20	140	60	30	40	8530	330	5580
Btg1	23340	1680	10	70	3830	1440	400	230	118670	720	153480
Btg2	10740	960	6	100	3610	1290	270	1010	42910	380	22110
Bt	32880	2200	8	470	9180	2480	330	600	41270	730	17390
Cca	48060	2600	8	730	16210	2200	400	1250	44210	840	35540
Subtotal for mineral soil	125910	8060	37	1395	33140	7540	1470	3150	261700	3600	238290
Standardized (kg/m^3)	11.6	0.7	0.004	0.128	3.0	0.7	0.13	0.29	24.0	0.3	21.9
Total for profile	163400	9150	47	1401	33770	7602	1532	3226	261747	3725	238331

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.

Carbon and nutrient content for compartment 859, Black Solodized Solonetz

Horizon	Total (kg/ha)		Extractable (kg/ha)		Exchangeable (kg/ha)				Digestible or extractable[a] (kg/ha)		
	C	N	P	S	Ca	Mg	K	Na	Fe	Mn	Al
Forest floor											
L	11070	390	2	1	260	40	30	10	10	80	10
F	32000	1520	5	6	1000	110	80	40	400	580	550
H	7630	390	0	1	320	30	20	10	7	40	0
Subtotal for forest floor	50700	2300	7	8	1580	180	130	60	417	700	560
Standardized (kg/m^3)	50.7	2.3	0.007	0.007	1.6	0.2	0.13	0.06	0.4	0.7	0.6
Mineral soil											
Ah	11610	1050	4	6	600	60	100	40	4400	1420	2470
Ahe	Horizon not sampled										
Ae	10400	1450	7	40	1020	200	100	270	14630	610	10170
AB	3310	340	2	10	480	110	50	80	8670	120	6120
Bnt	10740	1130	7	40	1710	420	170	220	32310	340	11820
Bt	21450	2000	10	50	4700	1200	380	400	40190	620	16700
BC	29430	2120	10	70	54460	1340	460	460	22310	1030	4680
C	18780	1160	8	50	4150	940	220	310	49960	2300	16770
Subtotal for mineral soil	105720	9250	48	266	67120	4270	1480	1780	172470	6440	68730
Standardized (kg/m^3)	9.3	0.8	0.005	0.026	1.7	0.4	0.14	0.17	16.6	0.5	6.6
Total for profile	156420	11550	55	274	68700	4450	1610	1840	172887	7140	69290

[a]Total digestible for forest floor horizons, sodium pyrophosphate extractable for mineral soil horizons.
Note: C = carbon, N = nitrogen, P = phosphorous, S = sulfur, Ca = calcium, Mg = magnesium, K = potassium, Na = sodium, Fe = iron, Mn = manganese, Al = aluminum.